Original FINO

Germany

FINOCAM KOMPAKT A/M

Fräsmaschine
Milling machine

06258DE/06259DE
06258EX/06259EX

FINO · der feine Unterschied · the fine difference · la fine différence · la fina diferencia · la differenza fine

Gebrauchsinformation · User Information · Mode d'emploi
Información sobre el uso · Informazioni d'uso
Gebruiksaanwijzing · Instrukcja stosowania

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1.1 The Manual

This manual will enable you to use the CNC machining systems FINOCAM KOMPAKT A/M as well as the accessory equipment safely and reliably. In this manual we want to advise especially about the possible sources of danger that may come from the systems and to emphasise the correct use of the systems. Accordingly, we request you to read this manual attentively and to heed the advice given.

1.2 Characteristics of the Machines

The systems FINOCAM KOMPAKT A/M are universally applicable CNC machining systems for dental technology. Their compact table housing contains the four-axis mechanism, the high frequency spindle SF 170 or SF 170P as well as the integrated controller. The software package DentalCAM for the generation of output data and the control software for the output of the data sets generated by the CAM software completes the particular system.

The integrated high frequency spindle admits high feed rates. Due to the precision bearing of the spindle axis, a top surface-quality of the treated workpiece is achieved. The rotary axis with collet chuck is equipped with a harmonic drive which offers highest true running accuracy for processing workpieces on their full circumference of 360 degrees. The automatic measurement of the rotary axis and the automatic axis compensation ensure a consistently high precision of the machining process.

1.3 Technical Data

1.3.1 Basic System

- dimensions (W/D/H): 400 x 385 x 410 mm
- four-axis mechanism;
  positioning range (x/y/z): 100 x 100 x 40 mm
- precise ball screw spindles for the
  3 linear axes with 4 mm lead
- motor resolution < 1 µm
- repetition accuracy ± 0.005 mm
- complete encapsulation of working area with closable front cover with front lid switch and safety interlock
- working area illumination
- prepared dust extraction through openings in the rear panel of the working area as well as hose connection sleeve and switching output at the side of the housing
  (requirements: external vacuum cleaner)
- underpressure sensor for monitoring the dust extraction – milling is only possible with activated dust extraction
- weight: approx. 45 kg

1.3.2 Rotary Axis

- rotary axis free from backlash with harmonic drive
- circular spline diameter 40 mm
- automatic measurement of rotary axis and the automatic axis compensation for absolutely exact results
- integrated fixing device for round universal blanks with a thickness of 10 to 25 mm and a diameter of 98 mm; KOMPAKT A includes 6 tool change stations

1.3.3 Spindle

- high frequency spindle with rotational speeds up to 60,000 RPM
- manual tool change with quick chucking device (KOMPAKT M)
- automatic tool change for 6 tools (KOMPAKT A)

1.3.4 Controller

- four-axis microstep controller
- simultaneous interpolation of 4 axes
- great smoothness of running and highly accurate
- due to microstep operation
- high processing speed due to exponential acceleration ramps and automatic change-over to full step mode
- look-ahead feature for continuous velocity along the path
- included control software for a comfortable output of the data which has been generated by the post processor
- speed limitations
  - minimal feed rate: 0.3 mm/s
  - maximal feed rate: 55 mm/s

1.4 Manufacturing Software

A productive CAM system includes a high quality manufacturing software that will effortlessly import your projects from different CAD design programs. When designing you projects you can use each CAD program. For the subsequent preparation of data for the machining process you get the included software package DentalCAM.

For operating the manufacturing software, please see the corresponding manuals.

1.5 Scope of Delivery

- CNC machining system KOMPAKT A/M
- 230V power supply cord
- keys for emergency release of the front cover
- service unit for compressed air connection plus hose ø 6 mm (KOMPAKT A)
- spindle service set for collet chuck maintenance
- hose connection for external vacuum cleaner
- 2.5 mm hexagon socket screw key for exchanging blanks
- calibration plate and measuring pin
- replacement tool measuring plate
- 1 pair of tool changer inserts of rubber
- 1 drill 2.8 mm for tool changer inserts
- USB connection cable
- USB dongle
- software licence DentalCAM including control software – latest version for download at www.vhf.eu
- software manual
- operating instructions

2. Installation

2.1 Placement

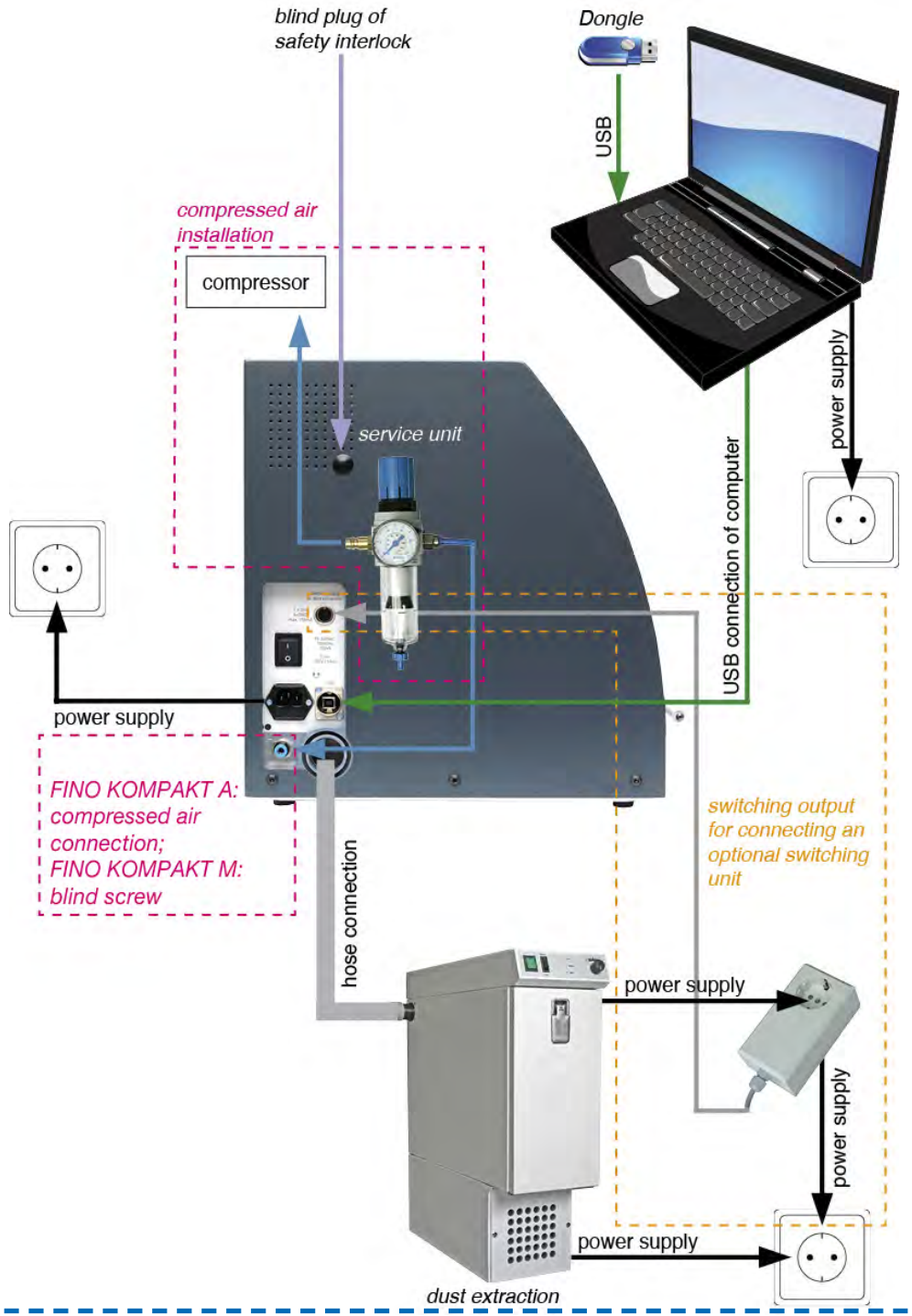
This machine must not be set up in moist rooms. The surface must be sturdy and even. The room temperature should be between 18 °C and 25 °C as this is the best range for the gliding quality of the employed lubricants. The relative air humidity may be max. 80%, non-condensing.
The machine has a voltage switching power supply. For connecting the machine, a power supply with 90-240 V AC and 50/60 Hz is needed.
Please also take care not to connect the machine to the same power net with other, insufficiently shielded, devices as these could electrically interfere with the high end controller and cause a failure of the system.

2.2 Setting up the Machine

- Unwrap the milling machine. Please keep the packaging for future service reconsignments.
- Connect the included service unit unit to your compressor using the standard compressed air connection plug and to the machine using the 6 mm connection hose and mount the service unit at the side of the housing (KOMPAKT A only; see also chapter 2.4).
- Connect the existing or provided manufacturing computer to the machine using the USB cable.
- Insert the suction hose with the hose connection into the connection sleeve of the machine (see also chapter 2.5).
- Insert the dongle into a USB port of the manufacturing computer.
- Plug the power supply cord into the machine.
- Plug the machines power cord in a separately fused circuit current or ensure that no devices are connected that cause heavy voltage fluctuation when switched on (air compressor, suction unit).

Caution!
Do not use a multiple socket!

Caution!
Before starting the machine, make sure that the front cover is closed.



2.3 Components of the Machines

Blind plug safety interlock
blind screws service unit
switching output for external vacuum cleaner
power switch
90-240 V AC, 50/60 Hz power supply
USB 2.0 connection
blind screw (KOMPAKT M) or
pneumatic connection 6 mm (KOMPAKT A)
connection sleeve for suction hose

front cover with safety contact
and safety interlock
high frequency spindle SF 170P
(KOMPAKT M: SF 170 with quick chucking device)
probe of underpressure sensor
integrated fixing device for universal blanks
(KOMPAKT M: without tool change station)
openings for dust extraction

[Illustration: Components of a KOMPAKT A]

2.4 Compressed air (KOMPAKT M)

The high frequency spindle SF 170P needs compressed air as spindles with an automatic tool change need compressed air for operating the pneumatic collet chuck. It also needs blocking air to prevent particles from getting into the spindle. The air consumption of the machine is at max. 80 l/min.

2.4.1 Compressed Air Supply

The scope of delivery of your CNC machining system includes a service unit for the compressed air supply. The integrated water separator with its 5 µm superfine filter is used to prevent that air which is contaminated with humidity or dust particles may damage the sensitive bearings of the spindle. However, the compressor must supply dry and oil-free air according to ISO 8573-1, as the water separator is only able to filter small rests. Compressed air which is not dry may lead to a damage of the spindle bearing and to electrical defects.

Air purity according to ISO 8573-1:

solid impurities

class 3 – filter grade at least 5 µm for solids

water content

class 4 – maximum pressure dew point +3 °C

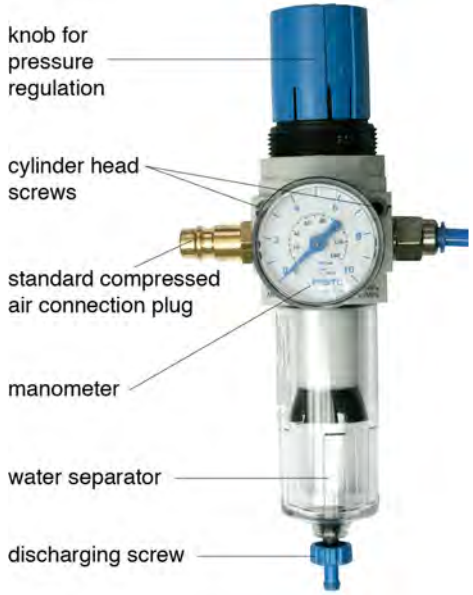
total oil content

class 5 – maximum oil content 1 mg/m³

The compressed air connection must deliver at least 7 bar continually.

2.4.2 Connecting the Compressed Air

The service unit has to be mounted in an upright position directly at the side of the housing. Remove the blind screws from the housing and fix the service unit with its cylinder head screws to the machine. Connect your compressed air supply to the service unit using a standard compressed air connection plug. The machine will be connected via the thin hose on the right side of the service unit.



[Illustration: service unit]

2.4.3 Settings

After you have connected your compressor with the service unit, please check if the manometer shows a pressure of 7 bar. If this is not the case, the knob has to be pulled up a little bit – only then it can be adjusted. By turning the knob toward "+" you can increase the pressure, turning toward "–" will decrease the pressure. Afterwards, please press the knob back down to prevent unintentional misadjustment.

2.4.4 Maintenance

Control regularly whether liquid has accumulated in the water separator and, if so, empty it by opening the discharging screw. The condensate will be blown out under pressure.

In case of strong dirt accumulation the micro-filter element in the water separator has to be cleaned or exchanged. A strongly foiled filter element may cause a loss of working pressure. Disconnect the air pressure by unplugging the main compressed air supply hose. Then you can screw out the beaker. After you have screwed out the supporting spring from under the filter element you can pull out the filter element. New filter elements are available as spare parts from vhf.

2.5 Dust Extraction

FINOCAM KOMPAKT A/M are prepared for the dust extraction with an external industrial vacuum cleaner. For this purpose, the machine is equipped with openings in the rear panel of the working area and with a hose connection sleeve and a switching output at the side of the housing.

For operating the dust extraction unit you need the provided hose connection and an external vacuum cleaner.

The machine is equipped with an underpressure sensor for monitoring the dust extraction. Milling is only possible, if the dust extraction unit is switched on and the required underpressure level has been reached. This prevents milling dust from entering into the mechanics and electronics of the machine.

Caution!

- Please keep in mind that your vacuum cleaner must be suitable for this application (micro-filter for processing hazardous materials, etc.).
- Empty the dust bag of the vacuum aggregate regularly and if it is equipped with a fine particle filter, replace it at regular intervals.

In all cases, heed the instructions and the safety regulations given by the manufacturer of your vacuum cleaner.
The vacuum cleaner is connected at the side of the machine housing. An illustration of connections is provided in chapter 2.2 “Setting up the Machine”.

2.6 Installing the Software

- Connect your manufacturing computer and start it.
- Insert the dongle into the USB port of this computer.
- Download the installation file of the software from the download section at www.vhf.eu.
- Unpack the ZIP file.
- Start setup.exe and follow the instructions of the installation program.
- For further information see the software manual.

Attention!

- Installing and operating the software and milling machine is only possible with inserted dongle.
- Please visit our website on a regular basis, check whether there is an update available and update your software.

3. Running the System

3.1 Operation

After you have ensured that all cables have been connected and the front cover is locked, you can turn on the machine using the power switch on its side.

For a milling job you only need the blanks which you want to use as well as the required tools. As the machine is operated through the software, you can find further details on handling the machine in the software manual.

The machine is equipped with a safety contact and safety interlock at the front cover. During milling the front cover can not be opened. **The machine must be operated with locked front cover.**

In case of a power failure you can unlock the safety interlock of the front cover with the emergency key in order to remove the blank from the machine. Therefore remove the blind plug at the left side of the housing. Unlock the door by turning the emergency key counterclockwise until the limit stop. Now you can open the front cover and remove the blank. Afterwards close the front cover and lock the safety interlock of the door by turning the emergency key clockwise until the limit stop. Then reattach the blind plug.

The machine is already calibrated on delivery. As long as your milling results are correct, there is no need for a further calibration. If your results should become inaccurate, a calibration could become necessary. In such a case, please contact a service technician before recalibrating the machine.

3.2 Safety

3.2.1 Intended Use of the Machine

The machines of the type KOMPAT A/M have been designed for easy to medium milling works. For milling works, it has to be considered that the machine cannot withstand all powers that can possibly occur. The machines are suitable for processing wax, most synthetic plastics (e. g. PMMA), nanocomposites as well as zirconium. Please keep always in mind not to use too high values for the cutting depth and the rate of feed. This could lead to ripping loose the workpiece and jamming the tool. This can cause irreversible damage to the machine and/or the spindle. Using the DentalCAM software, the software automatically calculates the optimal parameters.

3.2.2 Safetey and Protective Regulations

- The working personnel must be trained in the proper handling of the machine and in the following safety and protective regulations.
- The working place must be kept clean and orderly. Disorder in the working environment can be a cause of accident.
- Keep children and animals away from the machine.
- Only mill with activated dust extraction. Please keep in mind that your vacuum cleaner must be suited for this application (e. g. micro-filter for processing zirconium).
- **The machine must be operated with closed front cover and locked safety interlock.**
- Check the machine for possible damage. Before starting to work with the machine, ensure that all safety devices and their components are in place and in good working order. Damaged safety devices or parts thereof must, if not stated otherwise in the user manual, be repaired or replaced by authorised service personnel.
- While working with the machine in maintenance mode or when the front lid is opened, the working personnel and all persons within reach of the machine must wear protective safety glasses and a hairnet in case of long hair.
- Do not let the machine run unobserved.
- Using an external CAM software loud noise may arise from certain modes of work. In this case do wear ear protection. Loud noise is often a sign for wrong operating circumstances. Ensure that the workpiece is fixed properly and check the values for rotational speed, cutting depth, feed rate, tool endurance and the material.
- The safety devices of the machine are designed for practical use. **It is prohibited to circumvent or set out of use present safety devices.**
- While working in the maintenance mode there is the danger of squeezing when grasping into the working area.
- Be certain that the tools are set in entirely straight in the changing station and that they are placed in the positions indicated in the manufacturing software.
- A damaged cable may not stay in use. An original spare cable must be used to replace it.
- Make sure to read the preceding passage “Intended Use of the Machine“ in the user manual.

3.2.2.1 Spindle

For the operation, installation and maintenance of the spindles follow the regulations for the prevention of accidents. Improper handling or operations differing from the intended use of the machine greatly diminish the safety of usage!

- Do not use unbalanced tools at high rotational speeds. This applies to e.g. single tooth cutters and gravers. Such an imbalance makes itself heard by a loud running noise and puts a great strain on the ball bearing of the spindle.
- Do not use tools with cutting edge diameters that exceed the shank diameter.
- Caution! While working in maintenance mode do not grasp into the range of the rotating tool.
- Please be aware of the information about the choice of tools and the adjustment of tool parameters given in chapter 4.2.2.

3.2.2.2 Fixing Devices

- Always ensure and check that the tool and the workpiece are tightly fastened before starting the work. Due to high forces that act on the workpiece improperly fixed parts may loosen.
- In general, you should start with a relatively small cutting depth and increase it in small steps. A higher abrasive rate in milling works leads to stronger forces acting on the workpiece. If these forces exceed the fixing power of the fastening device the workpiece may come loose.

Please also note further advice given in the chapters dealing about the components you have in use.

3.3 Maintenance and Cleaning

3.3.1 Collet chuck

Please clean the collet chuck of the machining spindle once a week and heed the advices given in chapter 4 “Spindle”.

3.3.2 Fixing device

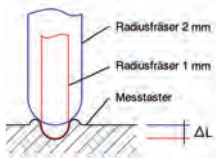
Please also clean the fixing device for workpieces at regular intervals with a soft brush or a vacuum cleaner.

3.3.3 Calibration

The machine is already calibrated on delivery. As long as your milling results are correct, there is no need for a further calibration. If your results should become inaccurate, a calibration could become necessary. In such a case, please contact a service technician before recalibrating the machine.

3.3.4 Measuring key

- The measuring key is a wear part. Wearing is caused by the contact between tool and measuring key and effects an indentation in the aluminium. The deeper the indentation is, the greater is the length difference (Δ L) of different tools.
- Due to dust and chippings on the measuring key, the spindle needs to apply excessively much force until the electrical contact between tool and measuring key is established.



- Hence keep the measuring key clean to minimize the wearing. It is sufficient, when you wipe the measuring key once with your finger before starting a milling job.
- For restoring the measuring key, please contact your service technician.

3.3.5 Internal Cleaning

Clean the machine regularly to prevent dirt and chips from accumulating in the guiding rails and other sensitive components of the system. Do not use compressed air for this, as it could blow the shavings into the guiding rails. Therefore, use a vacuum cleaner to remove the dirt.

3.3.6 External Cleaning (Housing)

- The cleaning of powder-coated surfaces should generally be done first with a soft dry cloth.
- If pollution cannot be removed in this way, the cloth can be moistened and also if necessary a ph-neutral cleaner can be used.
- Basically any contact between the powder coatings and alkaline or acid substances has to be avoided. Especially metallic powders show a high sensitive reaction.
- If the usage of a special cleaner is necessary to eliminate certain pollutions we recommend to check the applicability of the cleaner at a hidden place first.
- Please especially take care of the affixed machine labels, so that you don't remove them while cleaning the housing. They are especially sensitive to intensive rubbing and harsh detergents.

4. Spindle

4.1 HF-Spindle SF 170 (KOMPAKT M)

4.1.1 Features

- nominal power under continuous load (S1): 170 Watt
- maximal power (P max.): 240 Watt
- rotational speed range: 5,000 – 60,000 RPM
- collet chuck 3 mm
- precision shaft with double bearing
- quick chucking device for manual tool change

Caution!

The high frequency spindle SF 170 is a high precision device that may never be subject to any form of raw force like strikes!

4.1.2 Manual Tool Change

This spindle is equipped with a practical quick chucking device so that the manual tool change is done in seconds without any additional fastening tools. For this, press the turning knob down onto the spindle with gentle pressure until it locks into place. When the knob is engaged the spindle is simultaneously blocked.

Turning knob for quick chucking device
[Illustration: Quick chucking device on the SF 170]

A clockwise turn of the knob will fasten the tool, while a counter-clockwise turn will loosen it. For this, relatively little strength is necessary, too much force could damage the thread of the collet chuck. Only tools with an appropriate diameter can be mounted in the collet chuck. Always insert the tools up to the stop ring into the collet chuck. Before switching on the spindle, the turning knob must always be pulled out again in order to release the mechanical block on the spindle. Never turn on the spindle while the motor is blocked, as the resulting overheating would lead to serious damage of the spindle!

For exchanging the collet chuck, just turn the turning knob until the collet chuck comes out.

4.1.3 Maintenance and Cleaning

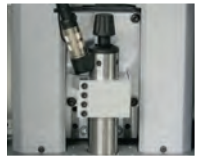
To guarantee a safe and precise operation of the HF spindle, the collet chuck has to be cleaned at appropriate intervals depending on the grade of staining. No grease or oil may enter inside the collet chuck. The inside cone of the spindle shaft has to be free of chips or any other dirt. Also the tool shafts have to be free from oil, grease and dust to ensure optimal tension force.

Do not use compressed air to clean the spindle, as dust could be blown into the sensitive bearing area otherwise!

Tool: clean and soft cloth, soft brush, spindle maintenance set
Duration: approx. 5 minutes
Frequency: This maintenance should be carried out once a week.

Procedure:

- Start the control software and choose the control panel. In order to execute a spindle maintenance, click on the button **“Spindle maintenance“**. The spindle will then be moved to a position, where it is easy accessible.



- In order to unscrew the collet chuck, press the turning knob down onto the spindle with gentle pressure until it locks into place. Possibly it has to be turned slightly at the same time. Afterwards turn the knob counter-clockwise to unscrew the collet chuck completely.
- Clean the internal cone of the shaft with the felt cone of the service set. The internal cone must be free of dirt.
- Clean the collet chuck with a clean and soft brush respectively the brush of the service set.
- After cleaning, apply a thin grease film on the thread of the collet chuck.

Attention!

No grease or oil may enter inside the collet chuck.

- Reinsert the collet chuck and tighten it slightly hand-tight by turning the knob clockwise. Finally pull the turning knob out.

Attention!

Do only use the grease of the service set. No other greases or oils must be used.

4.2 HF-Spindle SF 170P (KOMPAKT A)

4.2.1 Features

- nominal power under continuous load (S1): 170 Watt
- maximal power (P max.): 240 Watt
- rotational speed range: 5,000 – 60,000 RPM
- pneumatic collet chuck 3 mm
- precision shaft with double bearing
- automatic tool change station for 6 tools with automatic length detection

Caution!

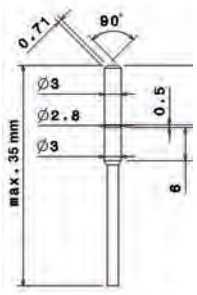
The high frequency spindle SF 170P is a high precision device that may never be subject to any form of raw force like strikes! Please note that the spindle may only be operated if the blocking air is switched on.

4.2.2 Automatic Tool Change

The tool change of a SF 170P is carried out automatically. There you dispose of a tool magazine with 6 tools. An adequate frequency converter is integrated in CAM 4-K4 Impression. Thus all spindle features are comfortably controlled by the production software.

For the usage with an automatic tool changer, your tools must necessarily be equipped with a stop ring. If you have any tools without stop rings, they must be fitted with stop rings. It is self-evidently that all inserted tools must suit the positions stored in the production software. Only tools with a shank diameter of 3 mm may be used.
Take all dimensions regarding the tools from the following drawing. The cutting edge diameter may be 3 mm maximal.

Tool dimensions:



For storing the tool in the tool changing station an unmachined shank with a length of at least 6 mm is required

As stop ring a retaining ring has to be installed into the existing slot.

Caution!

Install only retaining rings according to DIN 471-A3!

4.2.3 Maintenance and Cleaning

To guarantee a safe and precise operation of the HF spindle, the collet chuck has to be cleaned at appropriate intervals depending on the grade of staining. No grease or oil may enter inside of the collet chuck. The inside cone of the spindle shaft has to be free of chips or any other dirt. Also the tool shafts have to be free from oil, grease and dust to ensure optimal tension force and to guarantee an accurate tool change.

Do not use compressed air to clean the spindle, as dust could be blown into the sensitive bearing area otherwise!

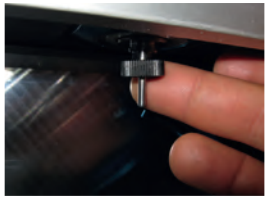
Tool: clean and soft cloth, soft brush, spindle maintenance set

Duration: ca. 5 minutes

Frequency: This maintenance should be carried out once a week.

Procedure:

- Start the control software and choose the control panel. In order to execute a spindle maintenance, click on the button „Spindle maintenance“. The spindle will then be moved to a position, where it is easy accessible. In order to open the collet chuck, confirm the according message with “OK”.
- Now take the measuring pin, insert it into the collet chuck and keep hold of it. Put the knurl cap of the service set over the measuring pin onto the edge of the collet chuck. By turning the knurl cap, you can unscrew the collet chuck from the spindle. The measuring pin thus avoids that the collet chuck is compressed and that the knurl cap can turn the collet chuck.



- Clean the internal cone of the shaft with the felt cone of the service set. The internal cone must be free of dirt.
- Clean the collet chuck with a clean and soft brush respectively the brush of the service set.
- After cleaning, apply a thin grease film on the outside of the collet chuck. This improves the conductivity and increases the clamping force of the collet chuck.

Attention!

No grease or oil may enter inside the collet chuck.

- Reinsert the collet chuck including the measuring pin and tighten it slightly hand-tight with the knurl cap. It should be possible to move the tool within the collet chuck without resistance.

Attention!

Do only use the grease of the service set. No other greases or oils must be used.

4.3 Tool Parameters

In the software DentalCAM all processing and tool parameters are already preset. If you use another CAM software the optimal values for lowering speed, cutting depth, rate of feed and rotational speed for processing your workpiece, depend on a number of factors:

- what kind of material does the workpiece consist of?
- power and range of rotational speed of the spindle
- minimal/maximal feed rate of the machine

You are provided with general advice and hints about the employment of tools in the vhf tool catalogue. In any case, the safety and protective regulations mentioned in chapter 3.2 have to be observed.

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Original FINO
Germany

FINOCAM

Softwarehandbuch
Software Manual

06258DE/06259DE
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FINO · der feine Unterschied · the fine difference · la fine différence · la fina diferencia · la differenza fine

Gebrauchsinformation · User Information · Mode d'emploi
Información sobre el uso · Informazioni d'uso
Gebruiksaanwijzing · Instrukcja stosowania

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1. General Information

1.1 Concept

The FINOCAM software was developed for safely and comfortably steering the 3D milling machines of the model range FINOCAM. The software consists of a CAM module and a CNC module.

In the CAM module you fill your blank with the STL data of your objects and manage and save the blanks. This module automatically calculates the files to be milled and generates the output for the FINOCNC software. Thus you are able to mill without previous knowledge.

The CNC module sends the milling data to the machine and monitors the milling process. Additonally you can start various calibrating and measuring processes.

1.2 About this Manual

By means of this manual, we want to guide you to safely and reliably use the programs FINOCAM and FINOCNC. Especially potential sources of danger which might emanate from the systems as well as the conventional application of the systems are pointed out. Hence we ask you to attentively read the manual and to accurately observe the given guidelines. For information about operating the machine as well as for security and protective regulations please view the operating instructions of the machine.

The following chapter explains the installation of FINOCAM and FINOCNC. Chapter 3 deals with the menu of the FINOCAM software. In the subsequent chapter you get introduced into operating the program by means of a practical example. The last chapter deals with certain functions and characteristics of FINOCNC.

2. Installation

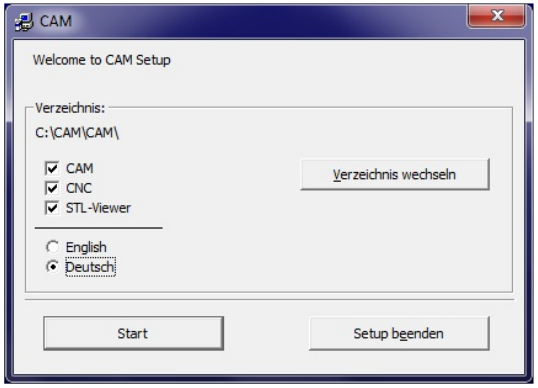
2.1 Minimal Requirements

- Windows 2000, Windows XP, Windows Vista, Windows 7
- free hard disk memory (for installation): ca. 100 MB
- RAM: at least 2 GB
- vertical screen resolution: at least 800 pixel

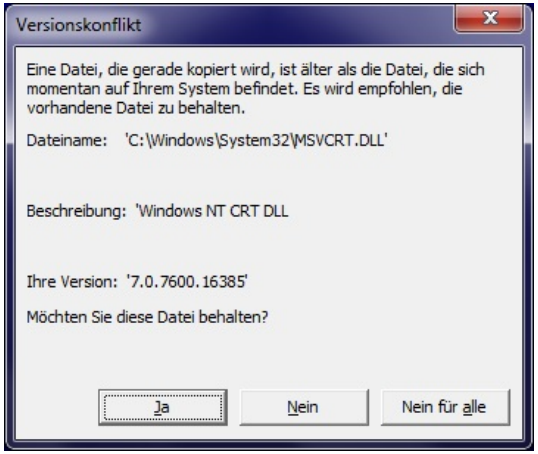
2.2 Program Installation

- Installing and operating the software and milling machine is only possible with inserted dongle.
- Insert the dongle into the USB port of the computer which you will use for operating the milling machine.
- Download the installation file of the software from the download section at www.vhf.eu.
- Unpack the ZIP file.
- Please deactivate any anti-virus program for the installation and reactivate it again afterwards.
- Start setup.exe and follow the instructions of the installation program.
- Caution! The setup language of FINOCAM is always German. If the program is installed, you can choose the program language (English/German) in the program settings (see chapter 3.2).
- If you want to choose another directory, click on ”Verzeichnis wechseln“ and change it accordingly. However, we recommend to install the program in the preset directory.

- Now confirm the installation directory by clicking on the button ”Start“.



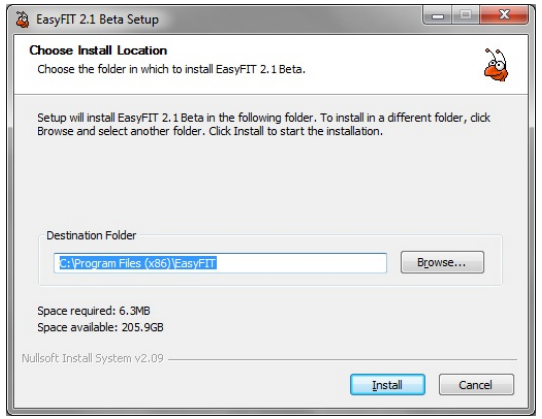
- If there are newer files during the installation, as in the example shown below, Windows will show you version conflicts. Please confirm the messages ”Möchten Sie diese Datei behalten?“ with ”Ja“.


Versionskonflikt
Eine Datei, die gerade kopiert wird, ist älter als die Datei, die sich momentan auf Ihrem System befindet. Es wird empfohlen, die vorhandene Datei zu behalten.
Dateiname: 'C:\Windows\System32\MSVCRT.DLL'
Beschreibung: 'Windows NT CRT DLL
Ihre Version: '7.0.7600.16385'
Möchten Sie diese Datei behalten?
Ja
Nein
Nein für alle

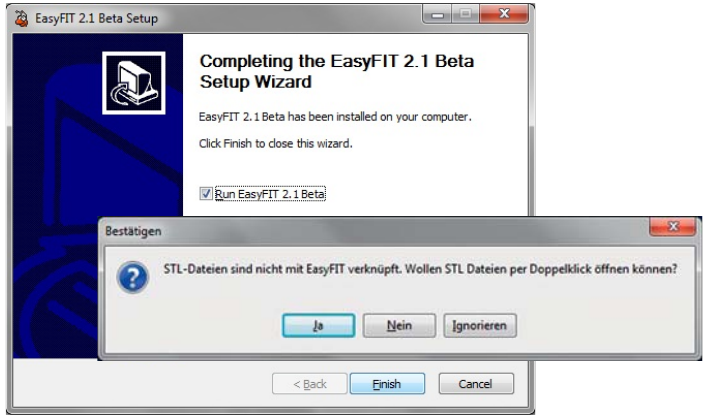
- Now the software FINOCAM is being installed. A window showing the installation progress appears. Version conflicts can also occur while installing. Confirm these with ”Ja“ to keep the existing data and not to overwrite them.

- Confirm the completion of the installation with “OK”.

- During the installation of the FINOCAM software, the installation window of the STL viewer EasyFit opens automatically. Now also install the STL viewer by following the instructions of the installation program. The STL viewer is not necessary for milling. But it is a useful tool with which you can easily and quickly check your milling files for possible errors previous to the nesting process.


EasyFIT 2.1 Beta Setup
Choose Install Location
Choose the folder in which to install EasyFIT 2.1 Beta.
Setup will install EasyFIT 2.1 Beta in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.
Destination Folder
C:\Program Files (x86)\EasyFIT
Browse...
Space required: 6.3MB
Space available: 205.9GB
Nullsoft Install System v2.09
Install
Cancel

- In order to be able to start EasyFit out of FINOCAM to check STL files, confirm the following message with “Ja”.



- Now connect your FINOCAM milling machine (supply voltage, emergency stop, dust extraction and if necessary compressed air) to your computer with the USB cable.

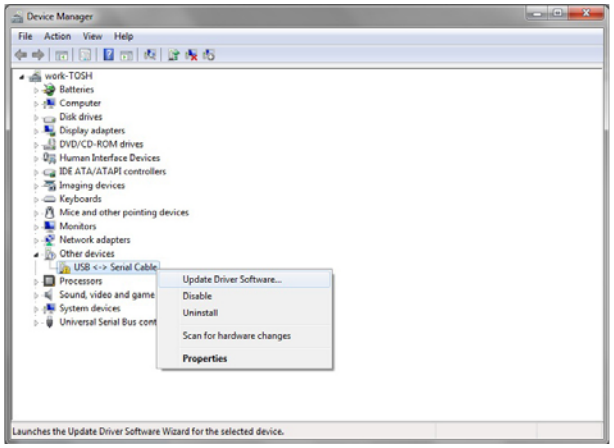
- After having checked all connections, switch on the machine. Mind that the front cover has to be closed. Further information about the installation of the machine can be found in the operating instructions of the machine.

- Windows now recognizes the machine as new hardware.

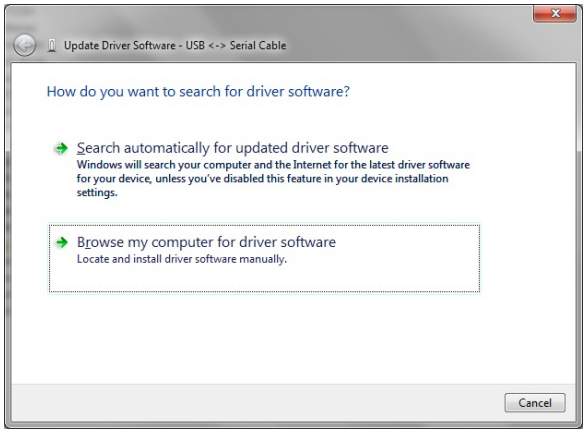
- If Windows doesn't automatically find and install drivers for the machine, they have to be installed manually.

- Open the ”Control Panel”, choose ”System and Security” and open the ”Device Mager”.

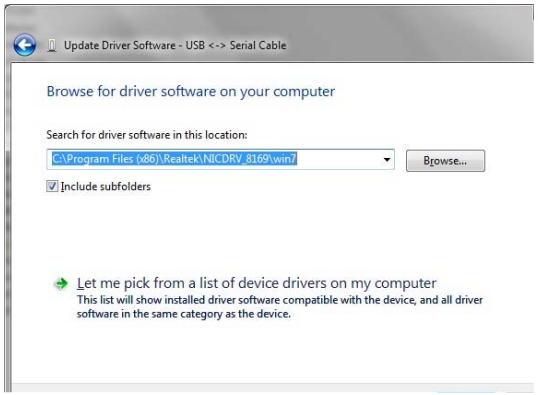
- Click with the right mouse button on “USB <-> Serial Cable” and choose “Update Driver Software...”.

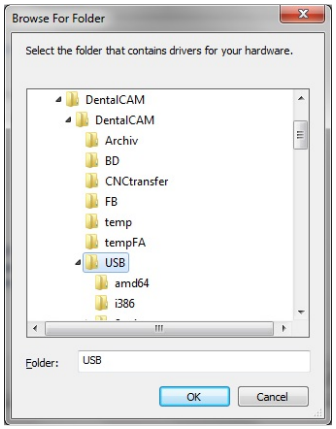


- Choose the option “Browse my computer for driver software” in the following dialogue window.

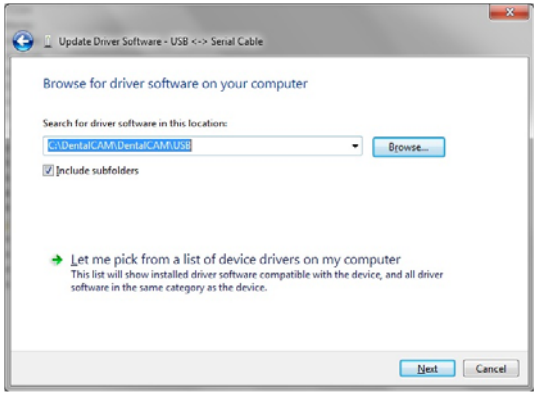

Update Driver Software - USB <-> Serial Cable
How do you want to search for driver software?
Search automatically for updated driver software
Windows will search your computer and the Internet for the latest driver software for your device, unless you've disabled this feature in your device installation settings.
Browse my computer for driver software
Locate and install driver software manually.
Cancel

- Now choose the folder with the drivers for Windows by clicking on “Browse...” and selecting the folder “USB” from the installation directory of FINOCAM.

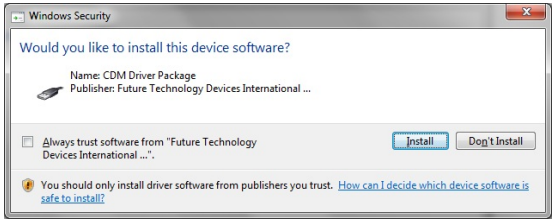

Update Driver Software - USB <-> Serial Cable
Browse for driver software on your computer
Search for driver software in this location:
C:\Program Files (x86)\Realtek\NICDRV_8169\win7
Browse...
Include subfolders
Let me pick from a list of device drivers on my computer
This list will show installed driver software compatible with the device, and all driver software in the same category as the device.

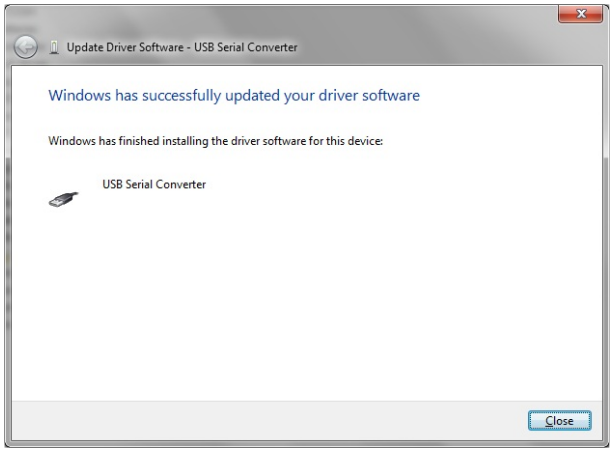


- The selected path is now entered in the previous window. Confirm the location of the driver software by clicking on “Next”.

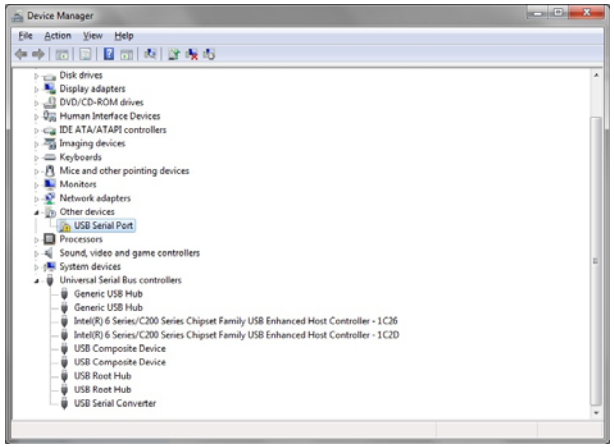

Update Driver Software - USB <-> Serial Cable
Browse for driver software on your computer
Search for driver software in this location:
C:\DentalCAM\DentalCAM\USB
Browse...
Include subfolders
Let me pick from a list of device drivers on my computer
This list will show installed driver software compatible with the device, and all driver software in the same category as the device.
Next
Cancel

- Install the drivers by confirming the following dialogue with “Install”.

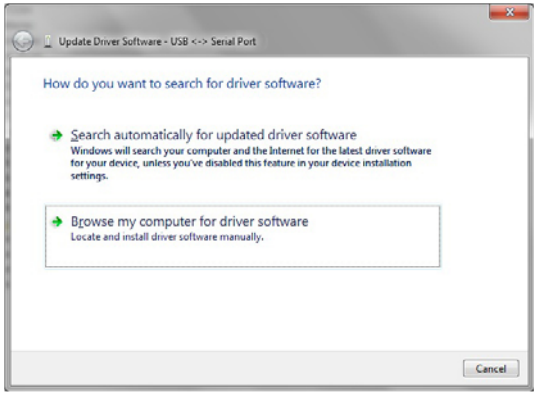

Windows Security
Would you like to install this device software?
Name: CDM Driver Package
Publisher: Future Technology Devices International ...
Always trust software from "Future Technology Devices International ...".
Install
Don't Install
You should only install driver software from publishers you trust. How can I decide which device software is safe to install?


Update Driver Software - USB Serial Converter
Windows has successfully updated your driver software
Windows has finished installing the driver software for this device:
USB Serial Converter
Close

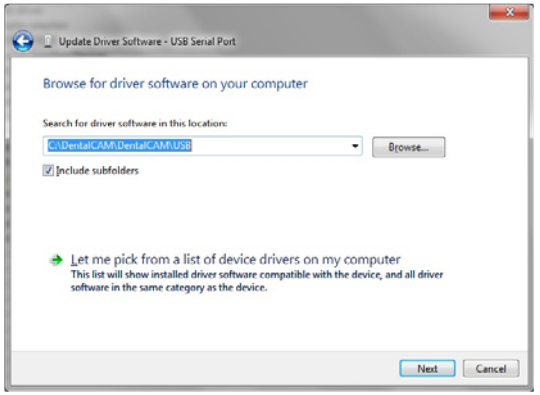
- For this purpose go back to the “Device Manger”. The labeling of the USB port has changed due to the first installation, as you can see in the following picture. Click on it again with the right mouse button and choose “Update Driver Software...”.

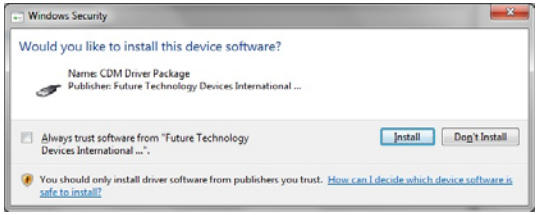


- Choose again the second option in the dialogue window.


Update Driver Software - USB <--> Serial Port
How do you want to search for driver software?
Search automatically for updated driver software
Windows will search your computer and the Internet for the latest driver software for your device, unless you've disabled this feature in your device installation settings.
Browse my computer for driver software
Locate and install driver software manually.
Cancel

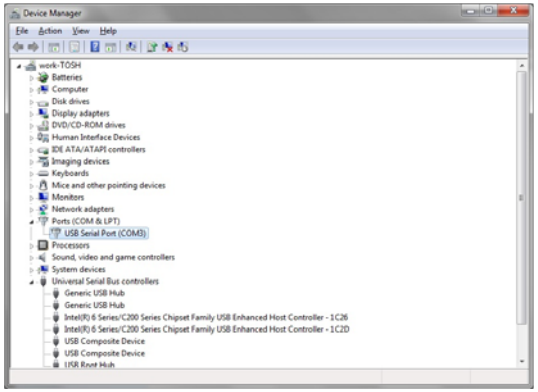
- The correct installation directory is already indicated this time. Confirm it with “Next” and “Install” the driver software.


Update Driver Software - USB Serial Port
Browse for driver software on your computer
Search for driver software in this location:
C:\DentalCAM\DentalCAM\USB
Browse...
Include subfolders
Let me pick from a list of device drivers on my computer
This list will show installed driver software compatible with the device, and all driver software in the same category as the device.
Next
Cancel


Windows Security
Would you like to install this device software?
Name: CDM Driver Package
Publisher: Future Technology Devices International ...
Always trust software from "Future Technology Devices International ...".
Install
Don't Install
You should only install driver software from publishers you trust. How can I decide which device software is safe to install?

Update Driver Software - USB Serial Port (COM3)
Windows has successfully updated your driver software
Windows has finished installing the driver software for this device:
USB Serial Port

- The USB port has been given a port number in the Device Manger, here: COM 3.



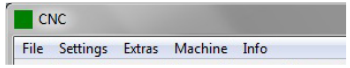
- The installation of the software and driver is now completed.

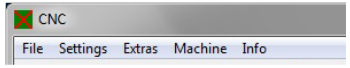
- Create shortcuts of the programs FINOCAM and FINOCNC on the desktop.

2.3 Establish the Connection

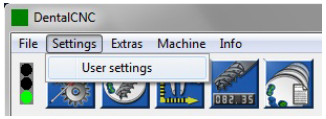
Start the program FINOCNC and check whether a connection to the machine is established.

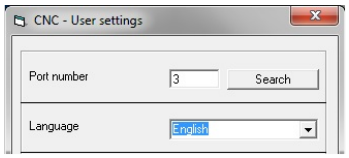
This is shown by a green square in the title bar of the window. If there is no connection, the green square is crossed out with red lines.





If the machine hasn't connected itself automatically, go to the menu "Settings", open the "User Settings" and click on the button "Search" next to the port number. The software now identifies the COM port to which the machine is connected and places the number in the according field.





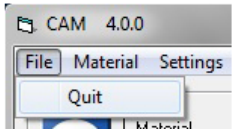
If the automatic search does not work, check the Device Manager of Windows for the port number to which the machine is connected and enter the number manually into the software.

3. FINOCAM Software

This chapter briefly explains the meaning of each menu.
A detailed step-by-step instruction is included in chapter 4.

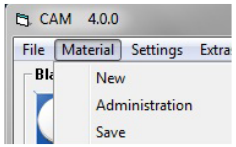
3.1 FINOCAM Menus

3.1.1 File



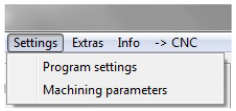
- **Quit** – leave the program

3.1.2 Material



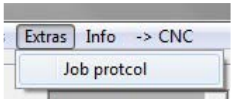
- **New** – open a new blank
- **Administration** – load a stored blank
- **Save** – store a blank

3.1.3 Settings

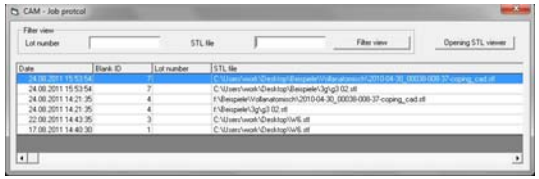


- **Program settings** – General settings like language, automatic functions, and various parameter settings. For details see chapter 3.2 "Program settings".
- **Machining parameters** – password-protected, only for service personnel

3.1.4 Extras

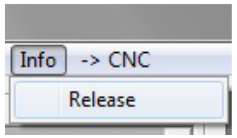


- **Job Protocol** – The most important data of your jobs are registered here. These are date, blank ID, lot number, STL file etc.



3.1.5 Info

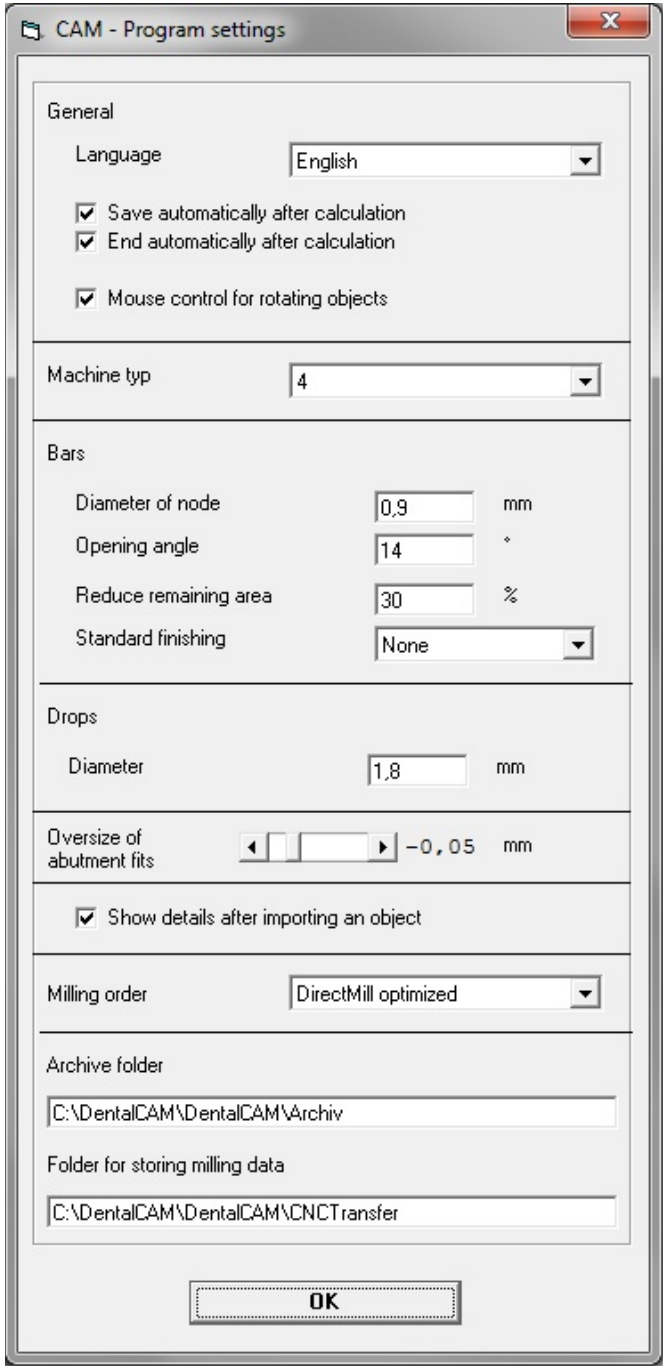
- **Release** – FINOCAM version information



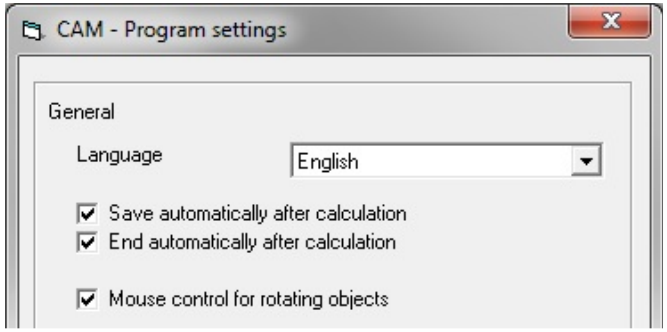
3.1.6 CNC

- Opens the program FINOCNC (see chapter 5 "FINOCNC")

3.2 Program Settings



General



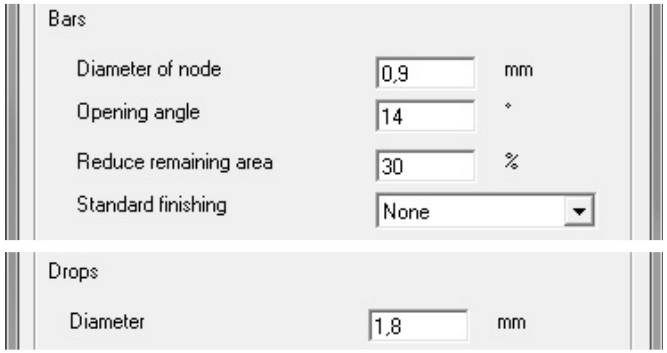
The program language can be switched between German and English. Afterwards the program has to be restarted. If the box for “Save automatically after calculation” is checked, your project will automatically be saved after the calculation. The function “End automatically after calculation” quits the CAM software after having started the calculation, as it isn't needed any longer. All further steps are processed by the CNC software.

Moreover, you can activate the mouse control for rotating the objects. Rotating with the keyboard is always possible, even if the mouse control is enabled.

Model range

The machine type which is operated by the software is indicated here. This feature is only required by service personnel.

Bars and drops

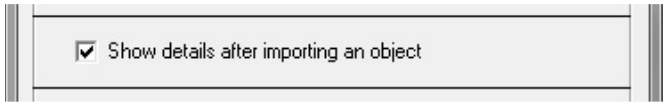


Here you can change parameters concerning the setting of bars and drops. For details see chapter 4.1.5 "Setting of bars and drops“.

Abutments

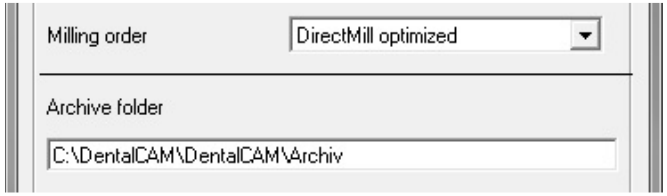
Indicates the oversize of the abutments. The abutment fits are increased by the indicated value.

Import



Enables or disables the display of object details when importing an object. For further explanation see chapter 4.1.3 “Choice of machining strategy“.

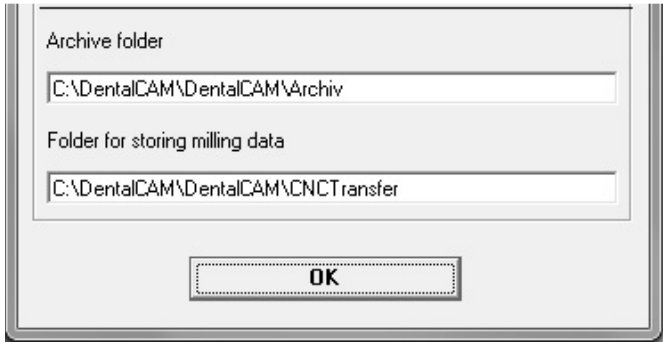
Milling order



The milling order of the objects on the blank can be set here. There are four different possibilities:

- **DirectMill optimized**: On the basis of the placed objects the program determines the optimal calculation and milling order.
- **From left to right** on the illustrated blank
- **From smallest to largest objects**.
- **According to the list**: in the order of the list of imported objects

File folders



You can find the archive folder to which the blanks are saved as well as the folder CNCTransfer in which the CAM software stores the calculated milling data under the indicated paths in your system.

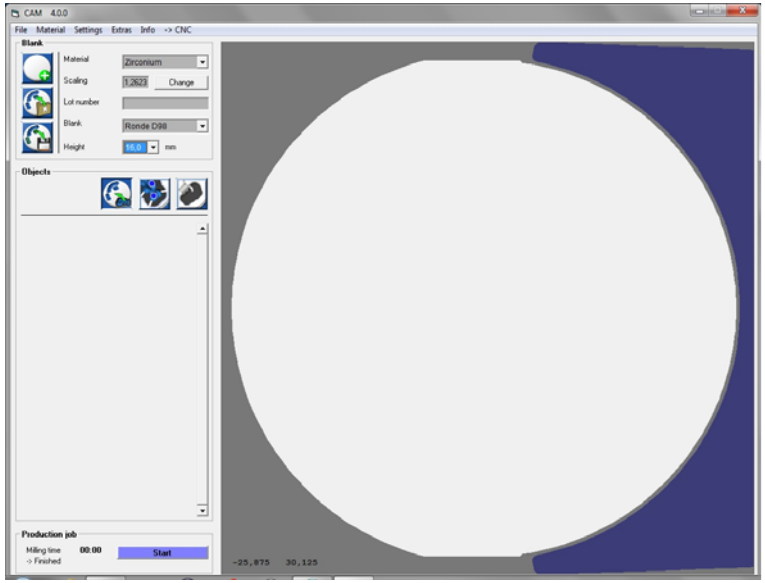
4. Work Flow

By means of an example file of a bridge, we guide you through the complete operating cycle of milling – from nesting the objects to the finished bridge. Please stick to this operating cycle as described in the following when milling your first work.

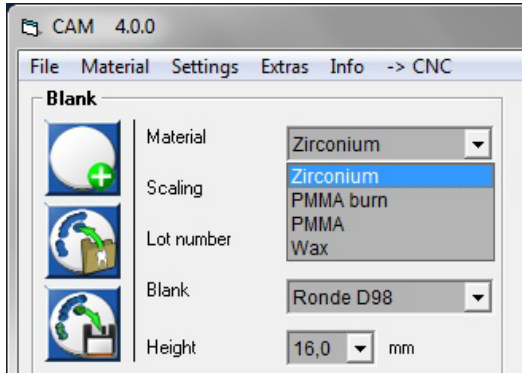
4.1 FINOCAM

4.1.1 Choice of Material

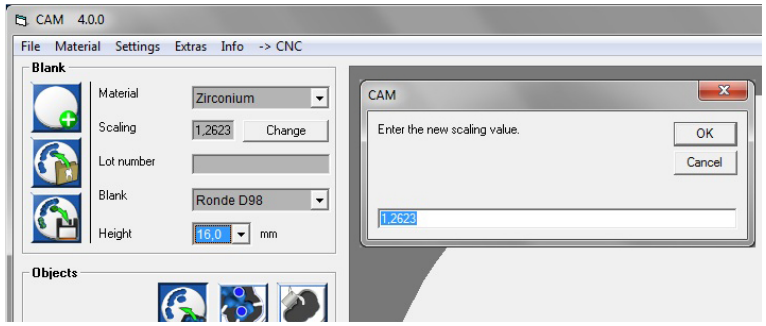
Please start the program FINOCAM.exe now. You will see the following interface:



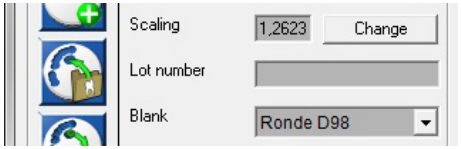
At first, choose the material to be milled (in this example zirconium).



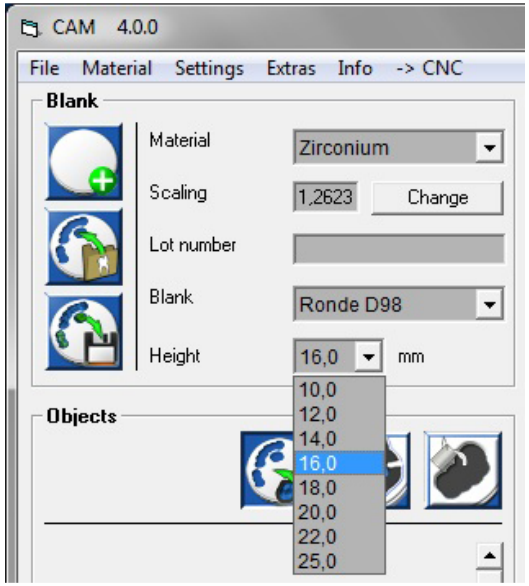
In the next step, indicate the scaling factor (here 1,2623) and confirm it with “OK”. The scaling factor compensates the degree of shrinking (z. B. 1,250 = 20 %) during the sintering process. By indicating the scaling factor the shrinking is automatically taken into account when nesting.



The field “Lot number” serves for entering the lot number of the used blank. Thus the lot number will be saved, too.

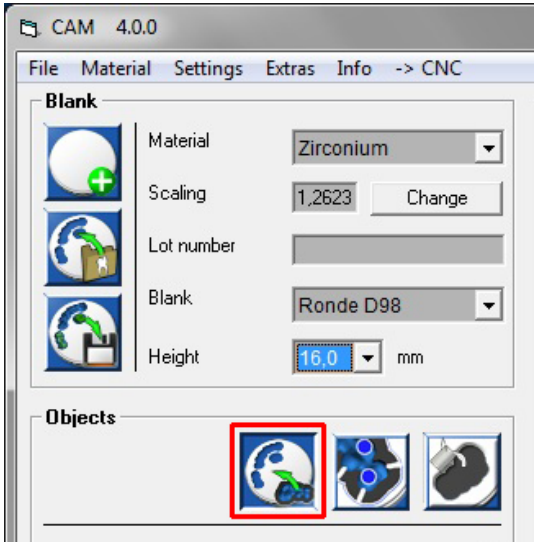


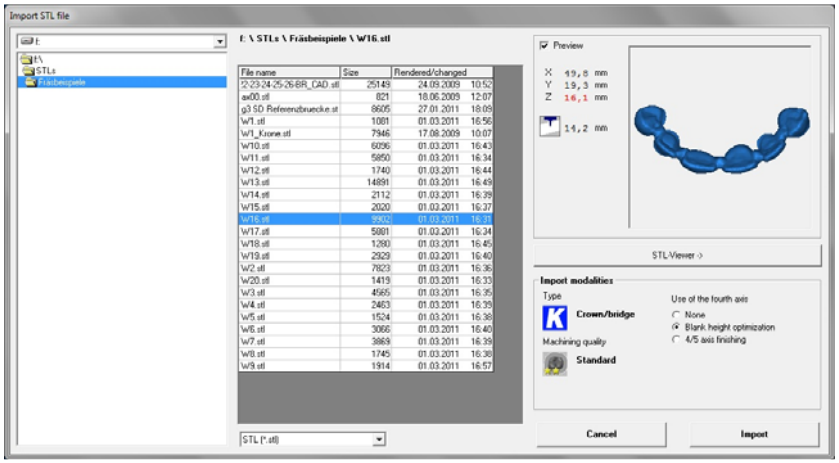
Afterwards define form and thickness of the applied blank.



4.1.2 File Import

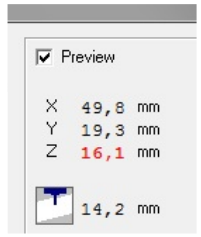
Now import a STL data set by clicking on the icon for importing objects and choosing the respective path of your files.

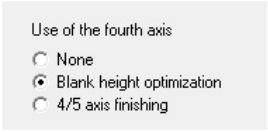




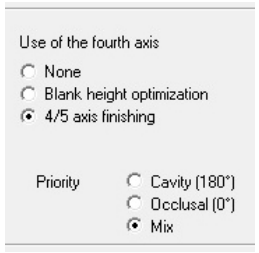
In the window for importing objects a preview picture of the STL file is shown and its measurements in X, Y and Z indicated.

The value for Z is displayed in red, if the chosen object is higher than the chosen blank. Is the blank height optimization set as default for the use of the fourth axis, the program immediately calculates, whether it is possible to use this object despite its height and displays the height by a slant a axis (blank height optimization). The height is not optimized automatically for objects which are not too high. But this can be enabled by clicking on the symbol. For example, if an object only fits very scarcely in the blank due to its height, it can be positioned a bit more centered in the material in this way.





The setting for the use of the fourth axis can be changed in the import modalities. Is “None” chosen, the X, Y and Z axis are working simultaneously and the fourth axis (A axis) serves as mere rotary axis which rotates only 180°. We recommend this setting if no material can be saved when using the blank height optimization.



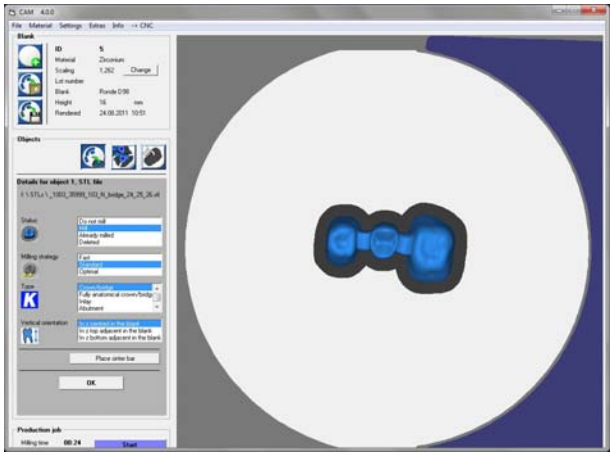
The 4/5 axis finishing as use of the fourth axis is employed for milling undercut objects. The objects are automatically placed in the blank so that by slanting the A axis (max. 10°) as many undercuts as possible can be reached and machined. Depending on their position and number, not all undercuts can be reached. By choosing the priority, you can set the type of the 4/5 axis finishing. By selecting “Cavity (180°)”, reachable undercuts on the bottom side of the blank will be machined exclusively. In contrast, choosing “Occlusal (0°)”, only reachable undercuts on the upper side of the blank will be processed. Using the default setting “Mix”, reachable undercuts on both sides of the blank will be machined. Having imported objects with undercuts, the undercuts will be displayed in red on the objects in the blank preview.

You can also select in the import modalities the type of the object and the machining quality already before the import by clicking on the respective symbol until the designated type/quality is shown. But you can change these parameters at any time after the import. Details are provided on the following pages.

Having chosen an object, it is placed in the middle of the blank.

4.1.3 Choice of Machining Strategy

After the import, the details of the imported object are displayed by default on the left side of the window. There you can choose the status, milling strategy, type and the vertical orientation of the object.

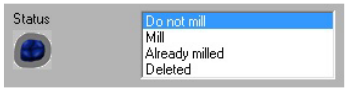


On changing a parameter the respective symbol changes accordingly. The same symbols are also displayed in the overview of all objects. The details can be set individually for each imported object. The parameters of the machining strategies – status, milling strategy, type and orientation – of different objects can be mixed freely within a blank. By confirming with ”OK“ you get to the entire list of all objects.

The different parameters are listed below:

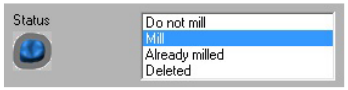
Status

- Do not mill



This object will not be milled. This is indicated by the symbol of a dark blue crown. The object itself which is shown on the blank is also coloured in dark blue. Objects with this status cannot be moved. For this purpose its status has to be reset to ”Mill“.

- Mill

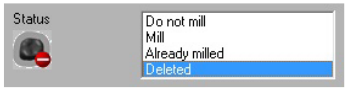


This object will be milled. The status symbol and the object are illustrated in light blue.

- Already milled

This object has already been milled. This is shown by the symbol of a green crown. The object itself on the blank is also coloured in green. Objects with this status cannot be moved. For this purpose its status has to be reset to ”Mill“.

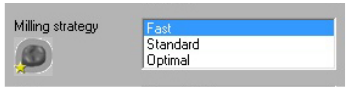
- Deleted



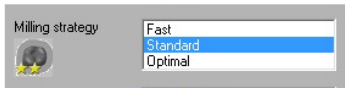
If you want to remove an imported object because it is, for instance, too high, you can set its status to “Deleted“. The object will then be removed from the blank, but remains in the entire list of objects with the status ”Deleted“. This status is indicated by a dark grey crown with a prohibitory sign. When a saved blank is opened again, the deleted object vanishes from the list.

Milling strategy

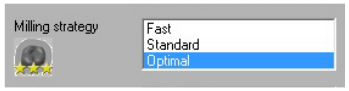
- Fast » grey crown with one star



- Standard » grey crown with two stars



- Optimal » grey crown with three stars



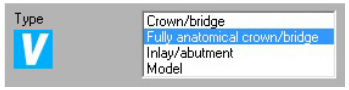
Type

The different types of object distinguish themselves by their machining strategy. The roughing process is the same for all and is executed with a 2 mm cutter. But in the finishing process the various types differ.

- Crown/bridge

A crown/bridge is not only roughed with the 2 mm cutter but also finished. Only the fit of the crown/bridge is finished with a 1 mm cutter.

- Fully anatomical crown/bridge



The fully anatomical crown/bridge is finished analogue to the crown/bridge with the 2 mm cutter, its fit as well as the fissures with the 1 mm cutter. Additionally the fissures on the upper side of the tooth are finished with an 0,6 mm cutter.

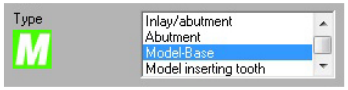
- Inlay

Inlays are finished with a 1 mm cutter. Is “Optimal” chosen as milling strategy, the inlay is additionally finished with a 0.6 mm cutter.

- Abutment

The 180° side (bottom side) of the abutment is just finished with a 2 mm cutter. The 0° side (upper side) and the drilling are additionally finished with a 1 mm cutter.

- Models

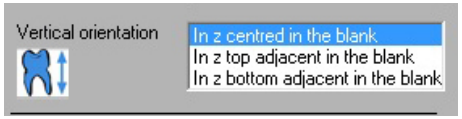


Models will only be finished on their upper side with a 1 mm cutter. These types are still in the development stage and therefore only to be used experimentally.

Vertical orientation

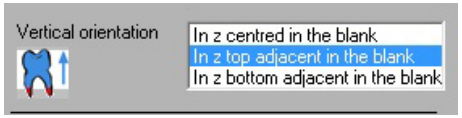
The adjustment of the vertical orientation is only possible, if “None” has been chosen as use of the fourth axis in the import window. Only then objects can be placed top or bottom adjacent in Z in the blank. If “Blank height optimization” or “4/5 axis finishing” has been chosen, the objects are always positioned in Z centered in the blank.

- In z centred in the blank



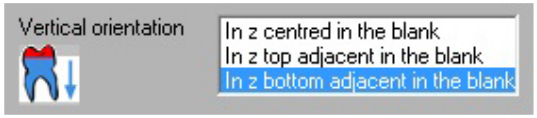
The object is vertically (in z) placed in the centre of the material.

- In z top adjacent in the blank



The object is vertically (in z) placed top adjacent in the material. This function can be used, for instance, if a model should be milled which is marginally higher than the blank. In this case the object would marginally be cut at its bottom side, but this wouldn't be a problem as only the base of the model would be cut.

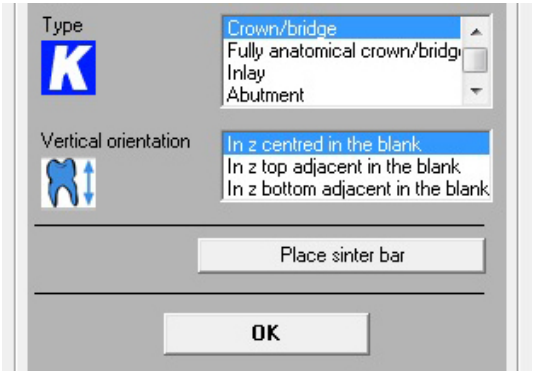
• In z bottom adjacent in the blank



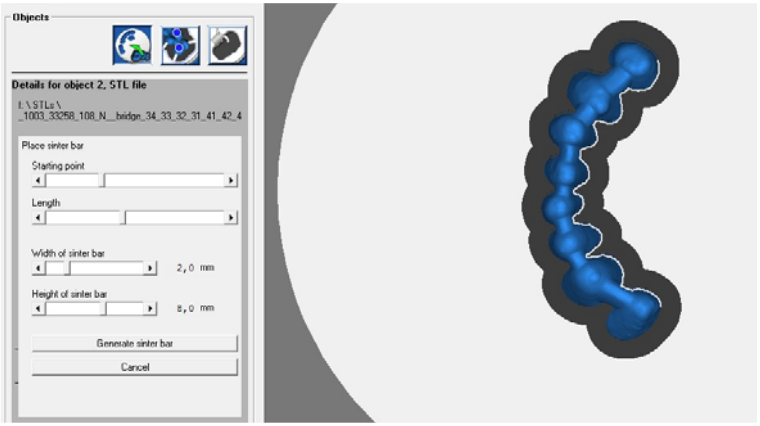
The object is vertically (in z) placed bottom adjacent in the material, so that the preparation line remains intact. The object is vertically (in z) placed bottom adjacent in the material. This function can be used, for instance, if a crown/bridge should be milled, which is marginally higher than the blank. As it will be veneered later on, it doesn't matter, if the upper side is marginally not completely. Thus the important preparation line at the bottom part of the work remains.

Placing a sinter bar

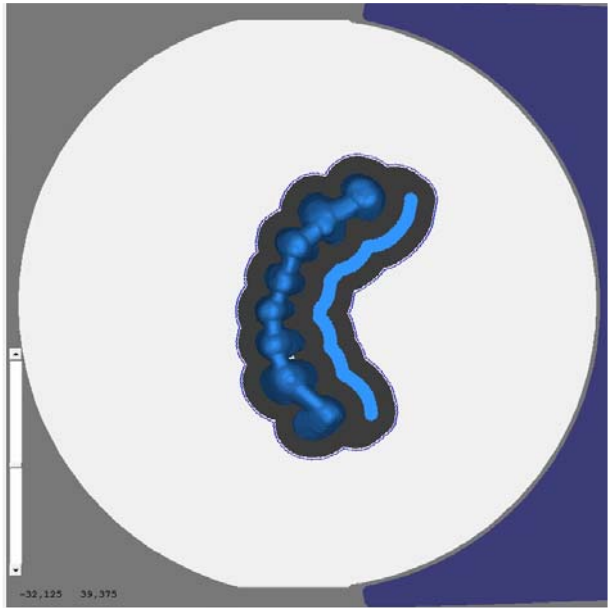
Additionally to changing parameters, you can also create a sinter bar in the detail view of the respective object. Thereto press the button ”Place sinter bar“.



Thus a dialog box for generating the sinter bar opens in the same area of the window. Using the scroll bars you can adjust the starting point, length, width and height of the sinter bar. The volume of the sinter bar should equal the volume of the object. By clicking on the button ”Generate sinter bar“ the sinter bar is calculated and attached to the object.

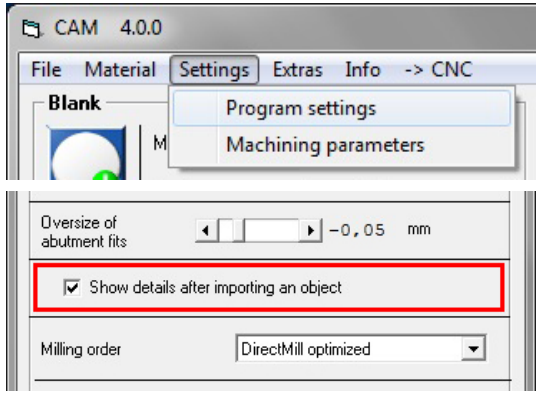


Then the object looks like this:

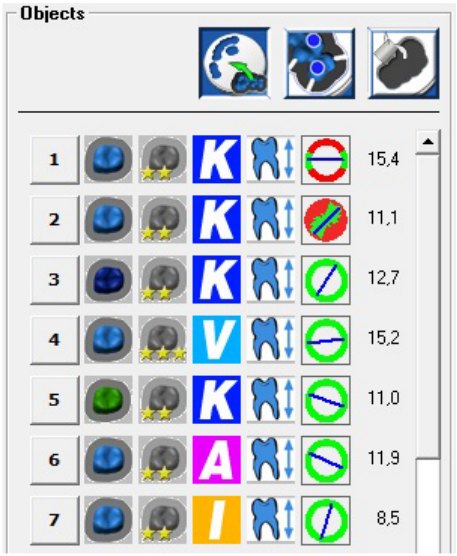


Afterwards, the object has to be connected with bars to the sinter bar. Details regarding the setting of bars are explained in chapter 4.1.5 “Setting of bars and drops”.

The default setting for displaying the object details when importing an object can be switched off in the menu ”Settings“ under ”Program settings“. You then only reach the detail view by clicking on the number of the according object in the list.



An entire list of several objects with different machining strategies could, for example, look like this:



The fifth symbol displays whether the blank height optimization (object 1) or the 4/5 axis finishing (object 2) is enabled. If the object is positioned in a way that it is within the green area of the ring, it suits into the blank due to the blank height optimization. If you turn into the red area, the object is too hight for the blank. In this area no optimization is possible. The height value is then displayed in red and an according warning is issued in advance to the calculation. Regarding the 4/5 axis finishing the green colour displays the undercuts. The object is positioned in a way that as much of the green area as possible is covered and thus as many undercuts as possible can be machined.

You can also change parameters in the general list by clicking on the symbol of the parameter which should be changed until the requested symbol appears. By clicking on the number at the beginning of each row you reach the detail view of the chosen object.

4.1.4 Nesting

Nesting is the space-saving placement of crowns and bridges on the blank.

In order to position imported objects, “pick” them holding the left mouse button pressed and move them to the designated position on the blank.

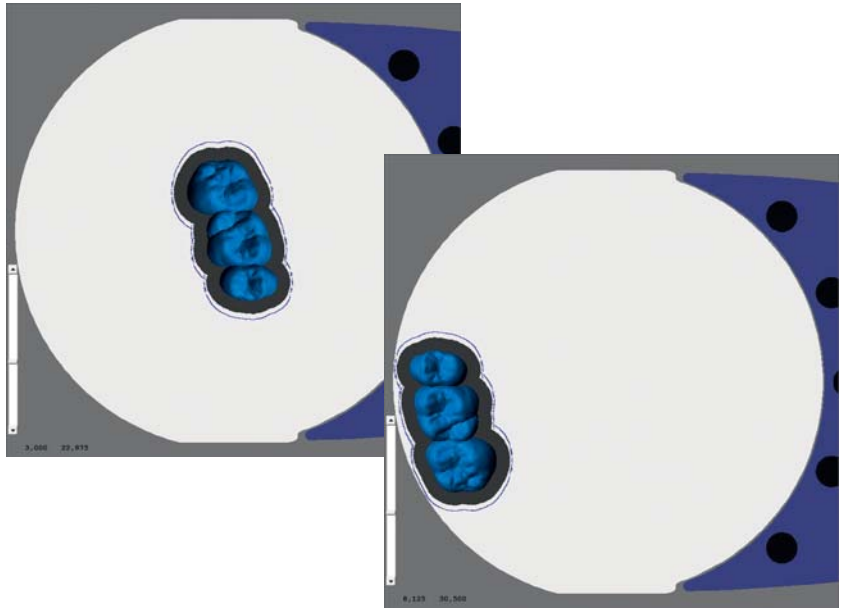
Rotate objects left or right in steps of 1°:
- “pick” + arrow keys up/down

Rotate objects left or right in steps of 5°:
- „greifen“ + Pfeiltasten links/rechts

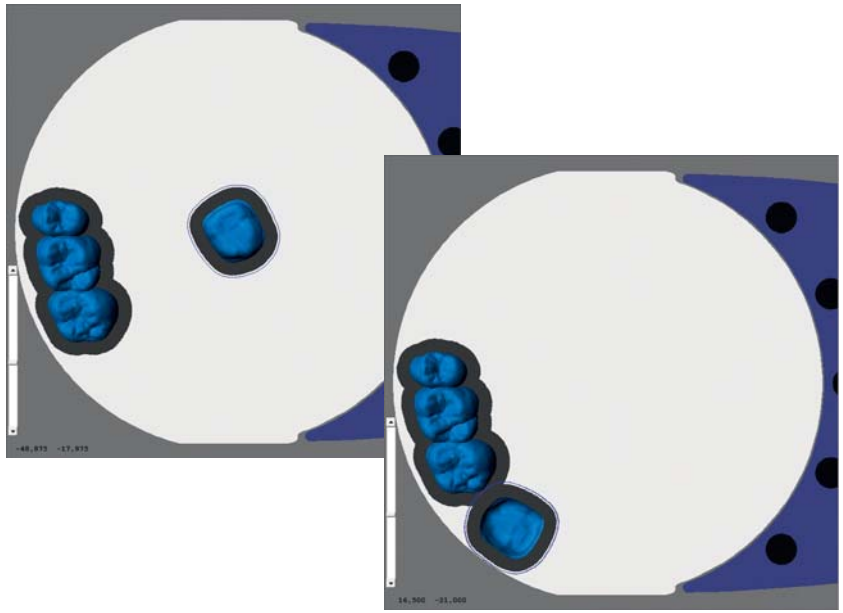
Rotate objects left or right 90°:
- “pick” + Ctrl + arrow keys

You can also rotate the objects with the mouse (scroll bar in the window).
For this purpose it has to be enabled under “Settings” » “Program settings”.

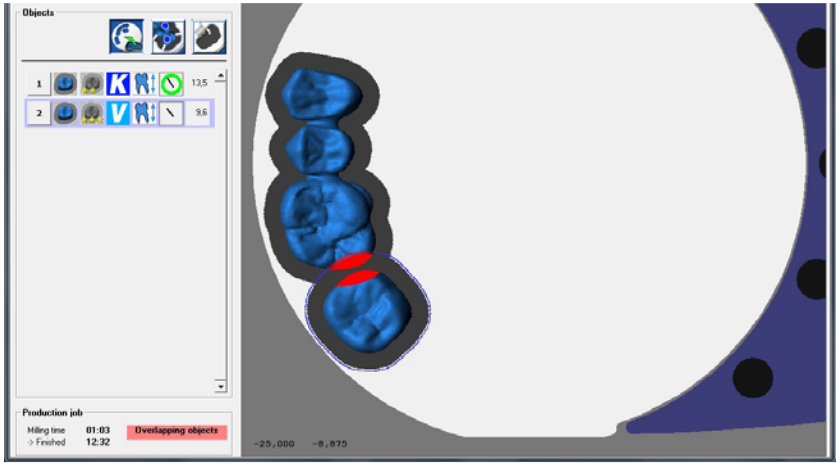
Now place the first object, then import another one and position them.



For an optimal utilization of the material you can overlap the workspace of the objects to some degree.



A critical overlapping of objects will be shown in red. Then it is not possible to start the calculation.

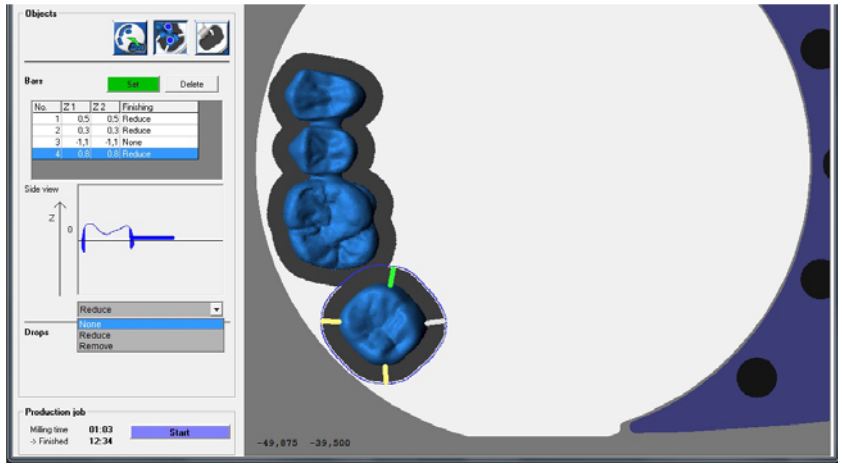


4.1.5 Setting of Bars and Drops

Now start with setting bars and, if necessary, drops by clicking on the icon for “bars/drops” or by doing a right click on a free space in the blank.

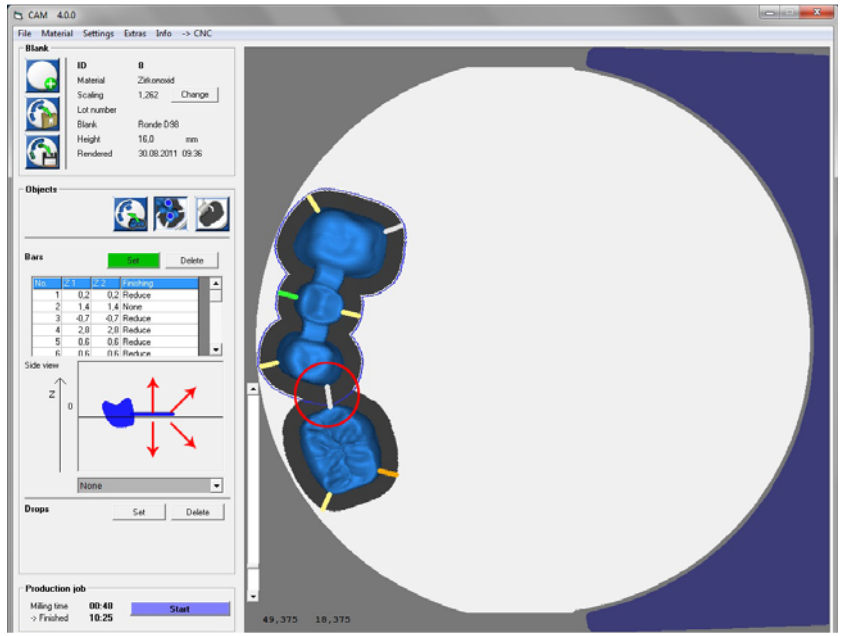
On the left side of the window you can see the dialog box for setting the bars and drops. To set bars and drops just click on the button ”Set“ and put them on the designated position of the work with a click of the left mouse button.

For each bar you can individually choose the finishing type. After the finishing process they can either remain unmachined, be removed completely or be reduced so that only few material remains. The default finishing type is the one which is set in the program settings. To prevent changing the finishing type for each object manually, set the finishing type as default which you use most frequently.



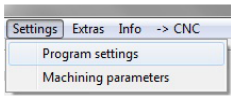
You can change the position of bars and drops at any time by picking them and moving them with the mouse to the designated position. If your blank includes overlapping objects, you can also set bars from one object to the other. In addition to chosing the finishing type from the drop-down menu, you can also change it by picking the bar and pressing the CTRL key.

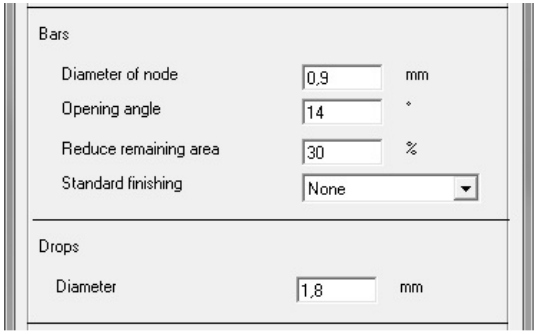
Furthermore, the vertical position of bars can also be changed on the left side. As default, they are set with a minimal distance above the equator of the crown respectively the tooth element. To correct the height of the starting point of the bar, pick the bar and move it upwards or downwards. Thus, you can prevent for example undercut objects. Due to the vertical adjustment of bars, undercuts can be minimized.



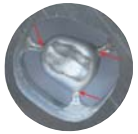
Delete bars or drops by clicking on the button “Delete” and then on the bar/drop in question.

You can also change some parameters concerning the geometry of the bars, in the “Program settings”, if necessary:





Diameter of node



The node is the most external point at the sideward bulge of the crown/bridge element (equator). The node is the starting point of the bar. The diameter of this point can be changed here.

Aperture angle

The aperture angle indicates with how many degrees the bar opens up from the node to the material border.

Reduce remaining area

Here you can set to how many per cent the bars will be reduced, if the the finishing type ”Reduce bars“ is chosen.

Standard finishing

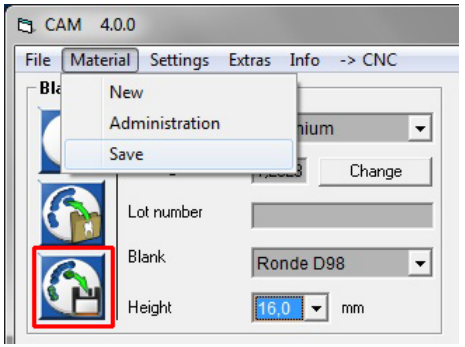
Choose the default finishing type for bars to prevent changing it manually for each bar. It is possible to not finish the bars, to reduce the bars so that only a very fine bar remains or to remove them completely.

Drops

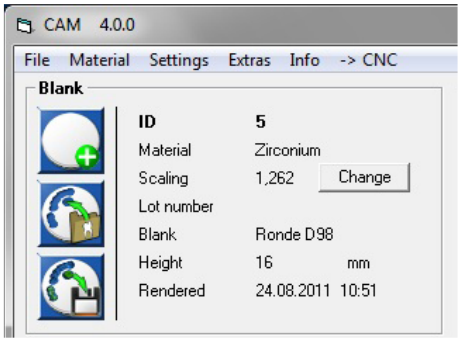
If necessary, the diameter of the drops can be adjusted here.

4.1.6 Material Administration

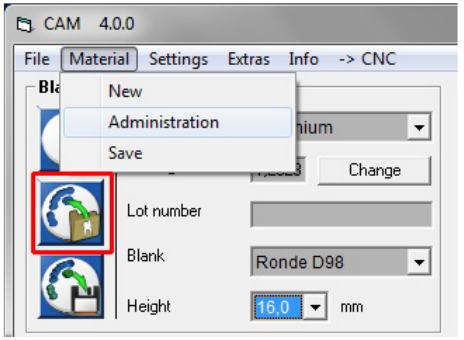
Having placed all objects and set bars and drops, you can save the blank for future usage under the menu item ”Material“ and ”Save“ or by clicking on the icon for saving a blank.



Each blank gets its own ID so that you may import this blank for further processing at any time until it is used to full capacity. Please write the ID number on the respective blank.

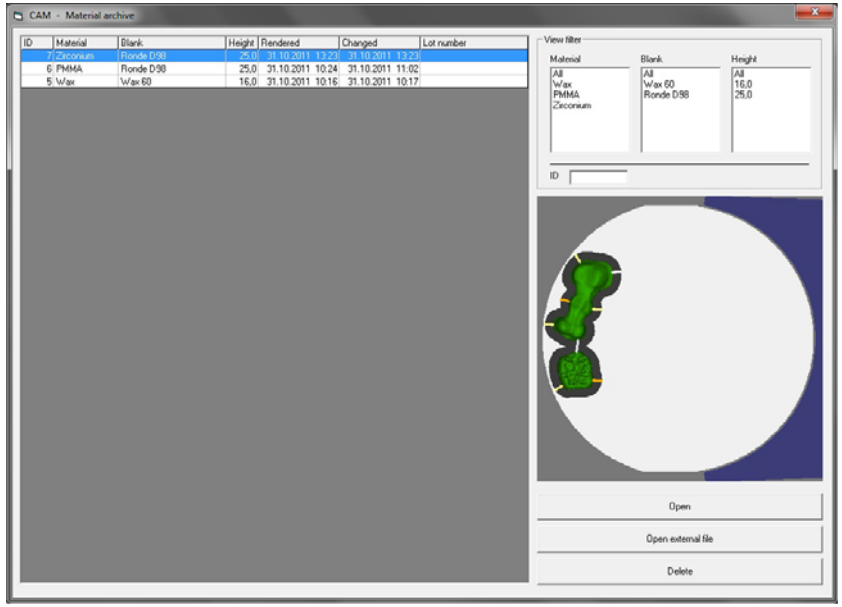


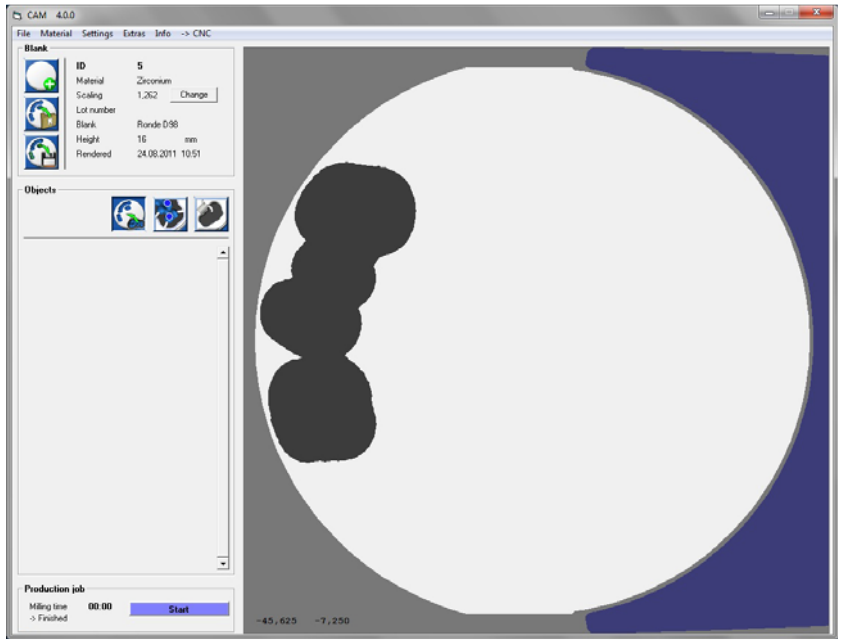
In order to import saved blanks from the material archive for further processing, open the material archive under “Material“ and “Administration” or click on the icon for the material administration.



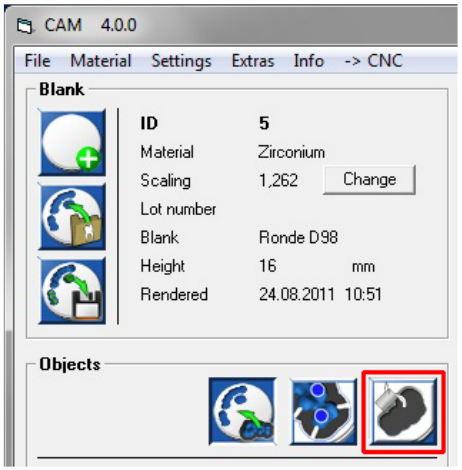
Analogous to the import of objects you see a preview picture.

If you load a blank which is already milled, you get empty areas instead of the original objects and the blank looks like this:

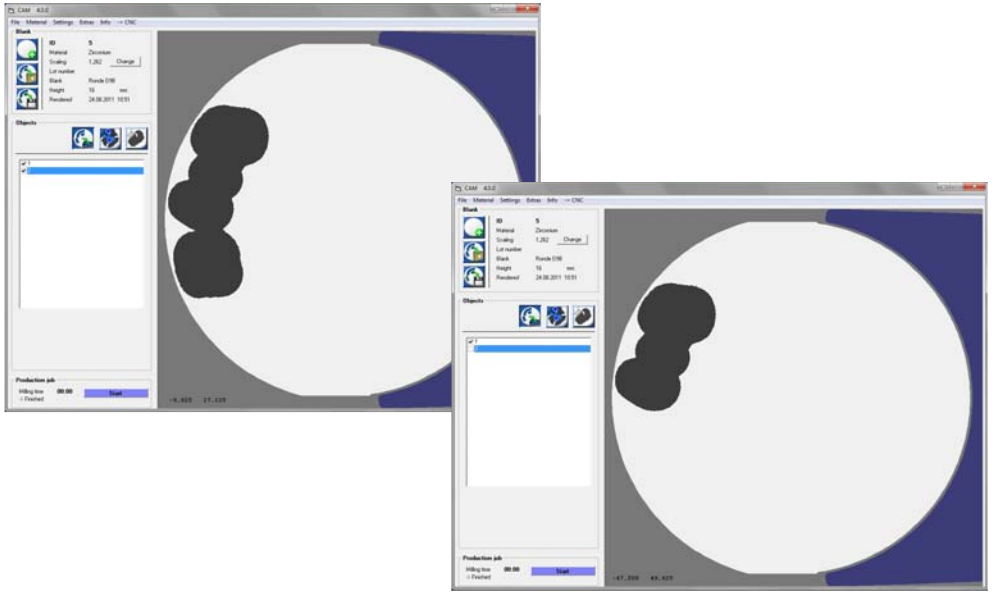




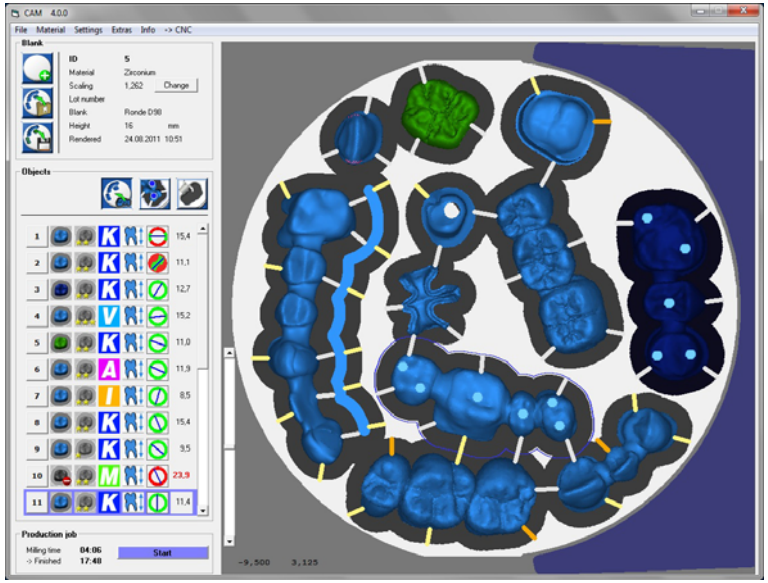
Assuming that the saved blank was completely calculated, but the milling process was not started or was aborted after one object, there is material remaining at this position. To be able to use it again, the according empty area can be filled. Therefore click on the icon for processing the empty areas.



On the left side you see the number of empty areas in the dialog box for empty areas. By disabling a box, the respective empty area is filled. Thus you can place a new object at this position. Having filled the empty areas, save the blank.

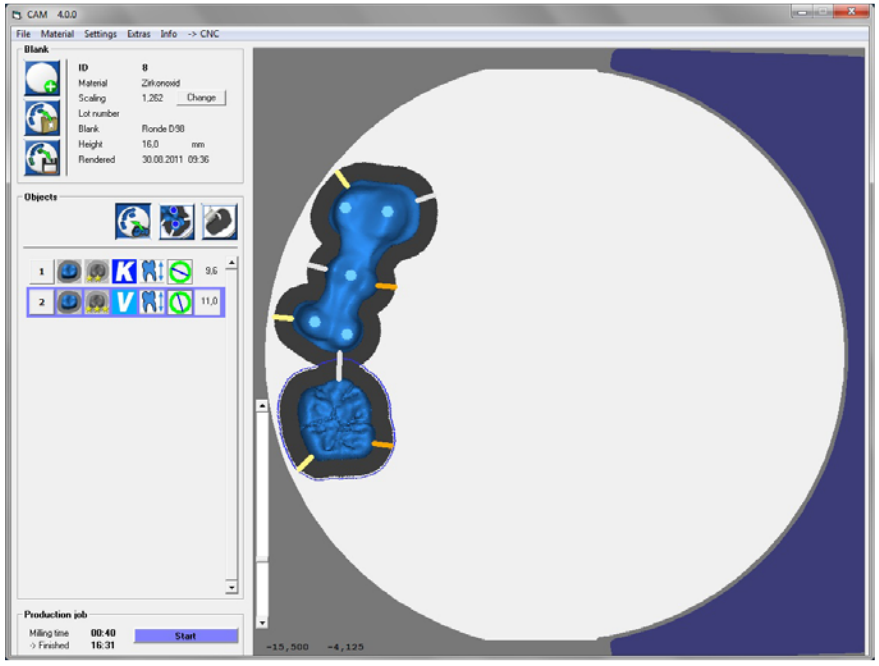


Finally a sample for a fully equipped blank:

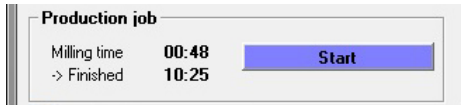


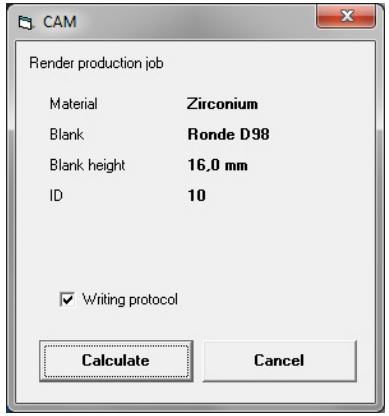
4.1.7 Starting the Calculation of the Production Job

On the previous pages we have created a new blank, imported two objects and positioned them. Finally we have attached bars and drops and made numerous settings. The prepared blank now looks like this:



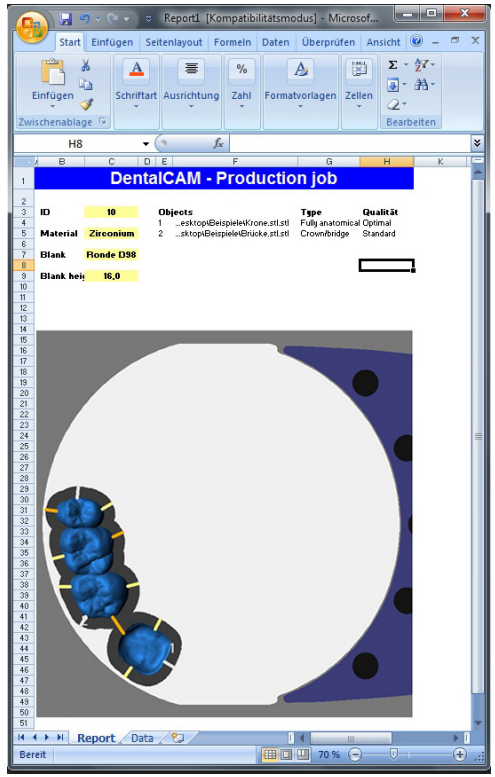
All preparations are now finished and the calculation of the production job can be started. Therefore click on “Start”.





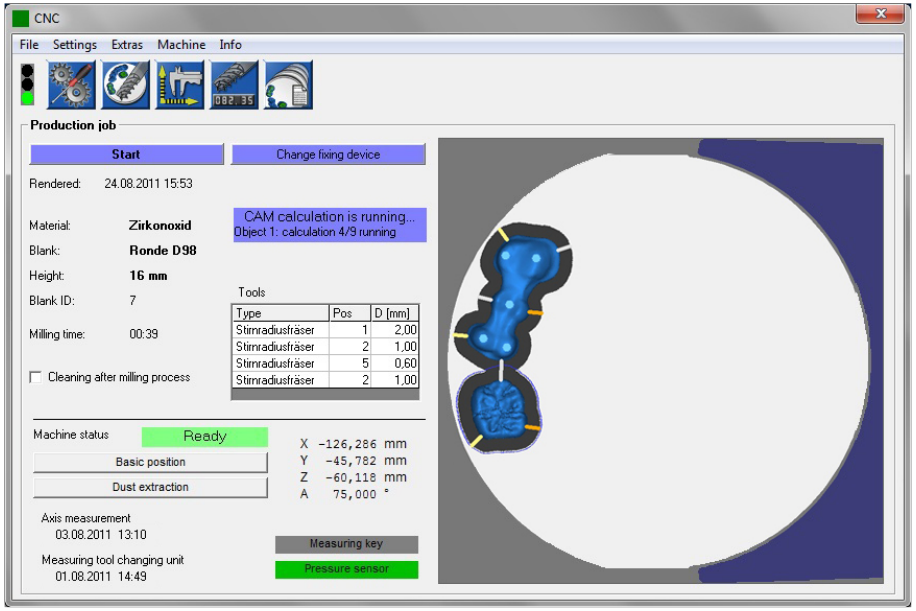
You get a message showing all details of your production job. If an ExcelTM protocol for this production job should be issued, enable the box for “Writing protocol”. If you do not have ExcelTM, do not check the box as it only works with Excel™. By clicking on “Calculate” the window of the FINOCNC software opens and the milling output is calculated. If the CNC software does not start automatically, open the program manually.

If you have chosen to create a protocol of your production job, it will open in Excel™.



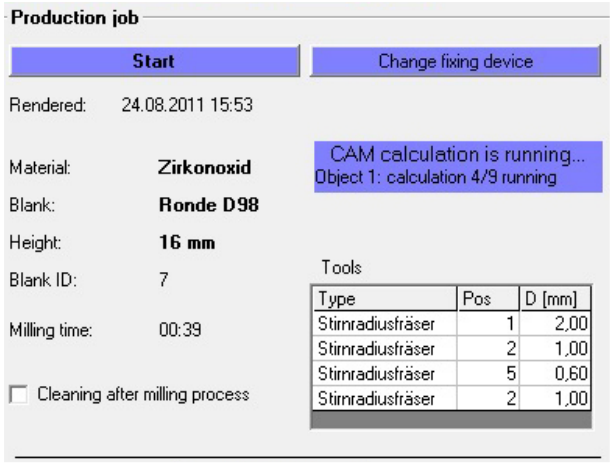
4.2 FINOCNC

The calculation of the milling output may take some time, depending on the used space. As the software is equipped with a “Direct Mill” feature, you can directly start the milling output while all other steps of the calculation proceed in the background.



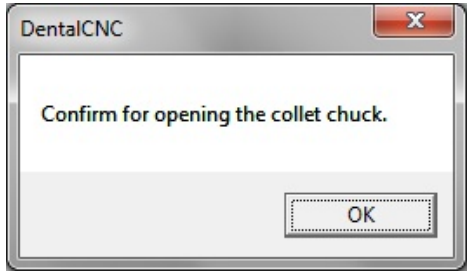
Please check, whether the correct tool is chucked in the spindle, respectively if the tool changing unit is equipped correctly before starting the milling output. Using a machine with automatic tool change, insert the cutters, as shown in the tool list, into the right position of the tool changing unit.

In this example, insert the 2 mm radius cutter into position 1, the 1 mm radius cutter into position 2 and the 0,6 mm radius cutter into position 5. The tool list shows all tools in the order of their usage.



After having checked the tools, you can start the milling process by clicking on “Start”.

The spindle moves to the center of the working area in order to release a possibly left tool at each first start of a milling job after a restart of the machine. If so, take the tool and confirm with “OK”.



Please mind that the dust extraction unit is attached correctly and switched on while milling.

During the milling process you can see a protocol of the different production steps and a progress indicator.

5. FINOCNC Software

The software **Workshop "Preforms & Modelle"**CNC can directly be launched as individual program and serves as machine control program. Moreover, you have got the possibility to start different calibrating and measuring processes. The CNC module sends the milling data, calculated by the CAM software, to the machine. Depending on the connected machine type (e. g. machines without tool changing unit) buttons which are not required are invisible.

5.1 FINOCNC Menus

5.1.1 Traffic Light

By double clicking onto the traffic light, the error protocol will be opened.
It displays error messages, if the traffic light is yellow or red.

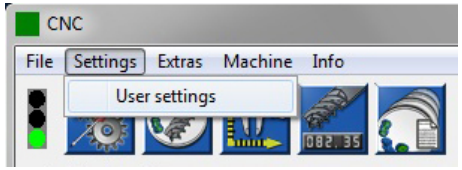
- **green traffic light** –
  No errors existent. You can mill.
- **yellow traffic light** – There is a message in the error protocol, but you can still mill;
  e. g. if the maximum endurance of a tool in the operation counter has been reached.
- **red traffic light** – There is a major error.
  You cannot mill; e. g. if there is no connection to the machine.

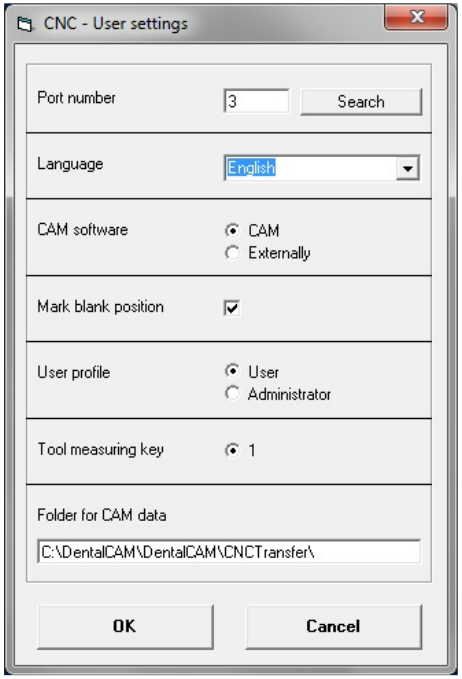
5.1.2 File

- **Quit** – leave the program

5.1.3 Settings

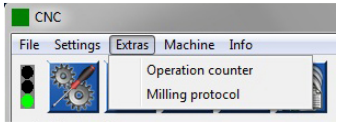
- **User settings**



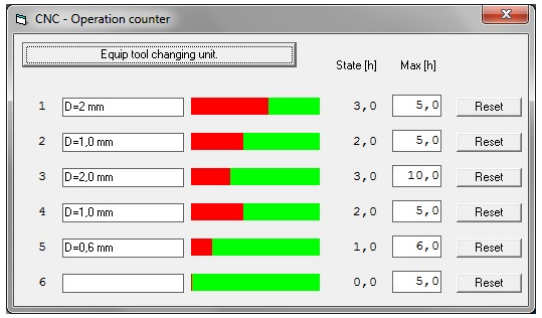


- Port number – establish the USB connection between machine and computer when connecting the machine (see chapter 2.3).
- Language – shifting between German and English. Afterwards the program has to be restarted.
- CAM software – indicates whether FINOCAM or an external CAM software is used.
- Mark blank position – if activated, the blank gets two drillings at its border, so that it will be easier to re-fix the blank at the same position.
- User profile – the default user type is "User". The admin area is password-protected and is only necessary for service personnel.
- Tool measuring key – indicates which tool measuring key is used.
- Folder for CAM data – indicates the path, in which the CNC software finds the data of the CAM software.

5.1.4 Extras

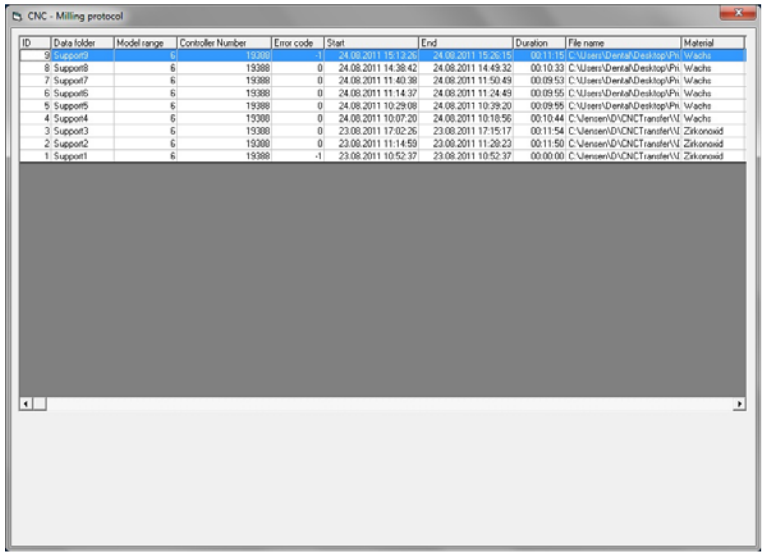


- **Operation Counter** – indicates operating hours for tools. The maximum endurance can be set individually for each tool. As soon as the preset maximum endurance of a tool is reached, a message is displayed in the error protocol (yellow traffic light).

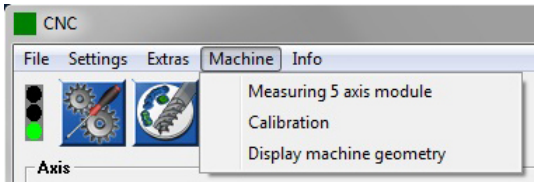

CNC - Operation counter
Equip tool changing unit.
State [h]
Max [h]
1 D=2 mm 3,0 5,0 Reset
2 D=1,0 mm 2,0 5,0 Reset
3 D=2,0 mm 3,0 10,0 Reset
4 D=1,0 mm 2,0 5,0 Reset
5 D=0,6 mm 1,0 6,0 Reset
6 0,0 5,0 Reset

Using a FINOCAM KOMPAKT A, you can also "Equip the tool changing unit" with the according button of this dialogue window. In this case the requested tool has to be inserted manually into the spindle and will then automatically be set into the right position of the tool changing unit.

- **Milling Protocol** – opens the protocol window, where the most important data of the milling job is logged. These are data folder, model range, controller number (machine number), possible error codes, start and completion time, duration as well as kind of material etc.



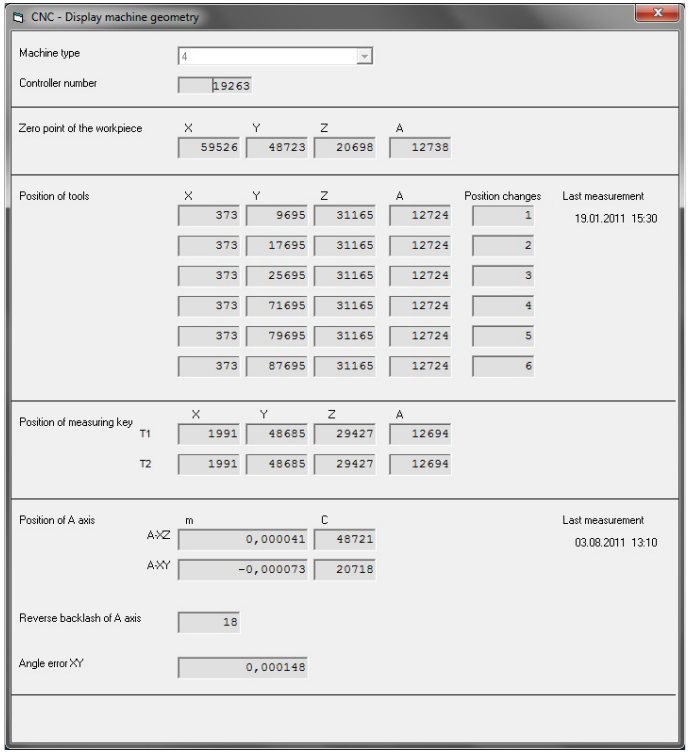
5.1.5 Machine



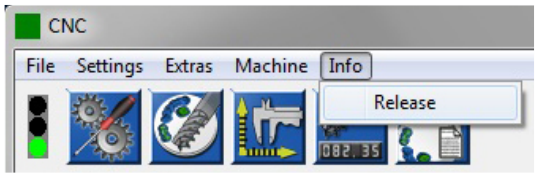
- **Measuring 5 axis module** – In order to use the 5 axis module in the milling machine FINOCAM T5, it has to be installed and measured. The measuring process is explained in chapter 5.3. The software guides you through the measuring process.

- **Calibration** – The calibration serves for determining differences in the spacial position of the axes, which may then be adjusted by the software compensation. The process of the axis measurement is described in chapter 5.4. The software guides you through the measuring program.

- **Display machine geometry** – This window indicates all sorts of technical data about the connected machine like the positions of the measuring keys, positions of the axes etc. This data is required by the machine itself (e. g. for axis compensation) and possibly by service personnel.



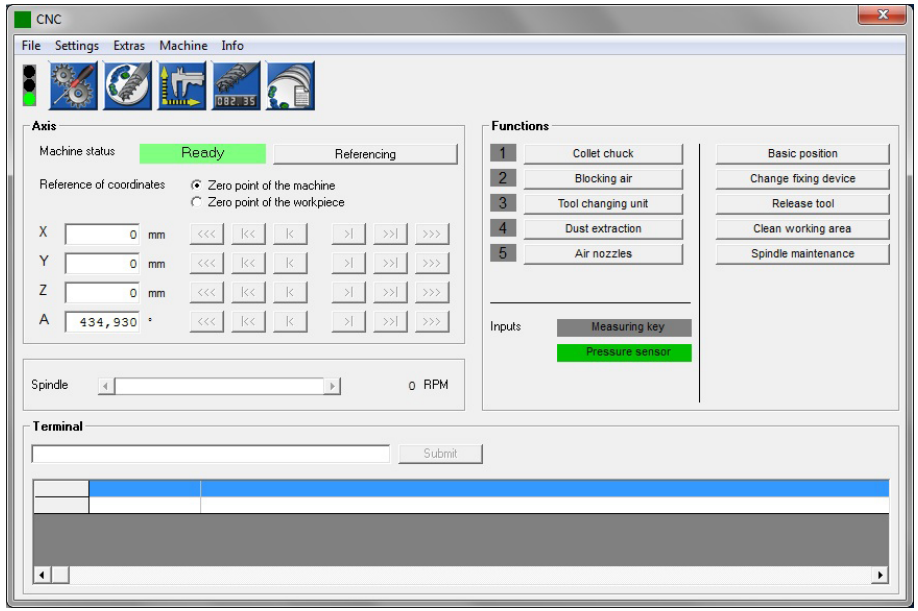
5.1.6 Info



- **Release** – FINOCNC release information.

5.1.7 Control Panel

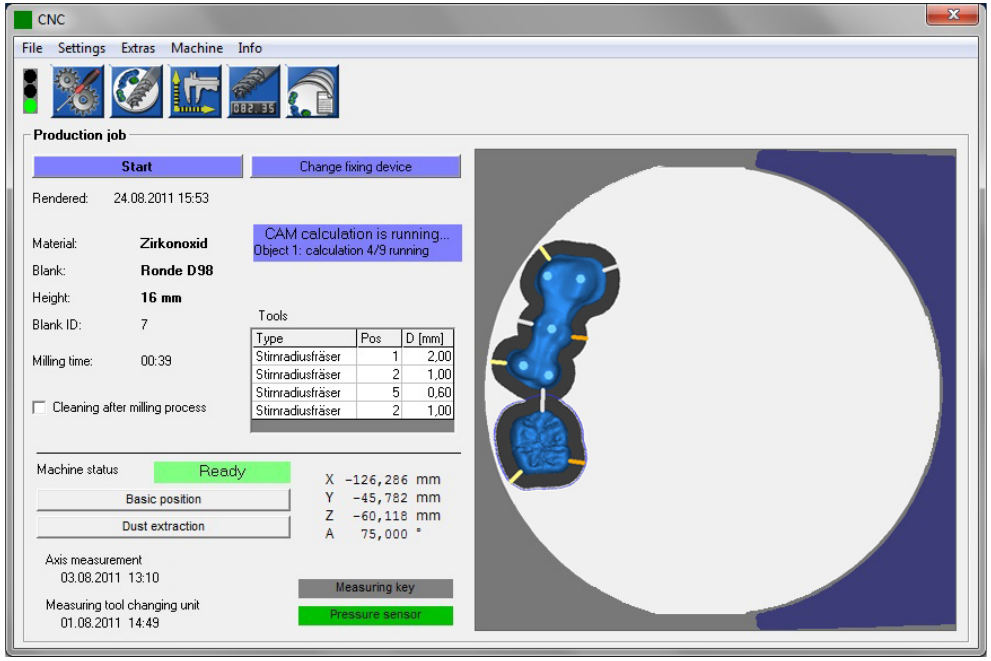
Using the control panel you can directly access the machine, reference the machine and enable and disable various functions. Chapter 5.2 "Control panel" explains the various functions in detail.



5.1.8 Production Job

This is the main view of the program and is displayed on every program start. This view shows you details of the production job and gives you an overview about the calculated or milled works.

By clicking on the coloured button "Start" the production job can be started. With the button "Change fixing device" the fixing device can be exchanged (FINOCAM T4/FINOCAM T5 only).

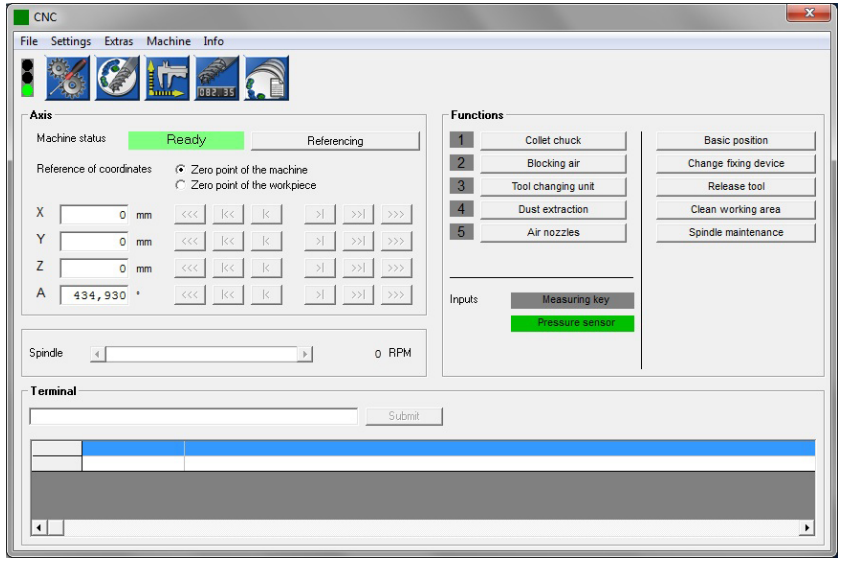


The buttons in the lower part of the window have the following meaning:

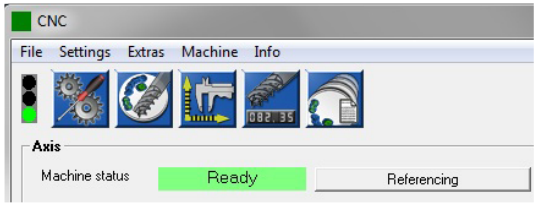
- **Basic position** – moves machine to basic position.
- **Dust extraction** – switches dust extraction unit off and on.
- **Measuring key** – signalizes mass contact of the tool (green). This is for your information only. The measuring key button may light up in different situations, amongst others, when calibrating or measuring the tool changing unit.
- **Pressure sensor** – signalizes the obtainment of the correct pressure (green button). Only applies to machines with tool changing un

5.2 Control Panel

Using the control panel you can directly access the machine and enable and disable various functions.



5.2.1 Axes



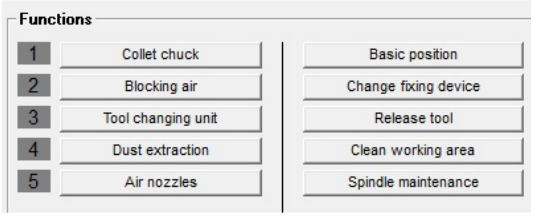
Referencing

- The machine will be referenced.

Moving the axes is only possible in administrator mode. The buttons of the steering panel are disabled.

5.2.2 Functions

Depending on the connected machine type (e. g. machines without tool changing unit) buttons which are not required are invisible. Most of the functions only have to be enabled/disabled manually in case of maintenance tasks.



1 Collet chuck
- Shows the status of the collet chuck (green = open/grey = locked).

2 Blocking air
- Switches blocking air on (green) and off. The blocking air is automatically controlled by the software and prevents chippings from intruding into the spindle.

3 Tool changing unit
- Switches clamping of the tool in the tool changing unit on and off. This clamping fixes the tools for the automatic tool change. The clamping is activated automatically by the software when executing a tool change.

4 Dust extraction unit
- Switches dust extraction unit off and on. During the milling process the dust extraction unit is automatically controlled by the software.

5 Air nozzles
- Enables or disables the air nozzles. During the milling process the air nozzles are automatically controlled by the software.

Basic position
- Moves machine to basic position.

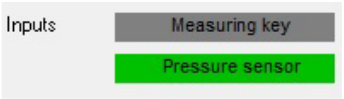
Change fixing device
- Opens collet chuck of the rotational axis for an exchange of fixing devices.
- Caution! Please insert always a fixing device as closing the collet chuck without fixing device may lead to damaging the collet chuck.

Release tool
- Ejects the tool. The spindle moves automatically to the middle of working area and the tool has to be taken manually. This feature is also necessary for maintaining the spindle (see operation instructions of the machine).
- Caution! The tool falls down and may damage, if it is not directly taken as soon as the collet chuck opens.

Clean working area
- Moves spindle and fixing device to a position in which the working area is well accessible for cleaning.

Spindle maintenance
- Depending on the degree of pollution, the collet chuck has to be cleaned in appropriate intervals. For this purpose, the machine moves to a position in which the spindle is easily accessible and opens the collet chuck, so that it can be removed for cleaning. Using a FINOCAM KOMPAKT M, the collet chuck has to be unscrewed manually with the turning knob. See the operating instructions of the machine for details about the spindle maintenance.

5.2.3 Inputs



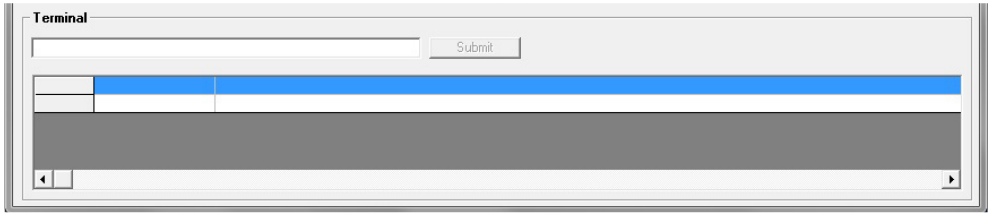
Measuring key
- Signalizes mass contact of the tool (green). This is for your information only. The measuring key button may light up in different situations, amongst others, when calibrating or measuring the tool changing unit.

Pressure sensor
- Signalizes the obtainment of the correct pressure (green button).
- Only applies to machines with tool changing unit.

5.2.4 Spindle

The rotational speed of the spindle can only be set manually in administrator mode.

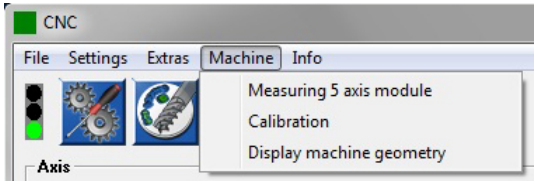
5.2.5 Terminal



Manual commands can be only be sent to the controller in administrator mode.

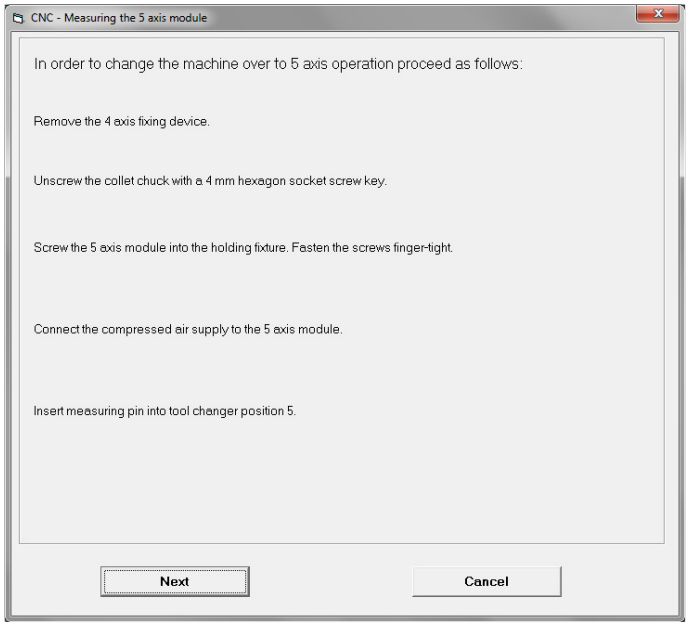
5.3 Measuring the 5 Axis Module

Having installed the 5 axis module in FINOCAM T5, you can start the measuring. Its installation is explained in the operating instructions of the machine. Choose the measuring of the 5 axis module from the menu “Machine”. The software guides you through the measuring process.



- Confirm the following message with “Next”, in order to start measuring the 5 axis module.

- By confirming the message, the collet chuck opens. Follow the instructions of the software and finally confirm the installation of the 5 axis module with “Next”.

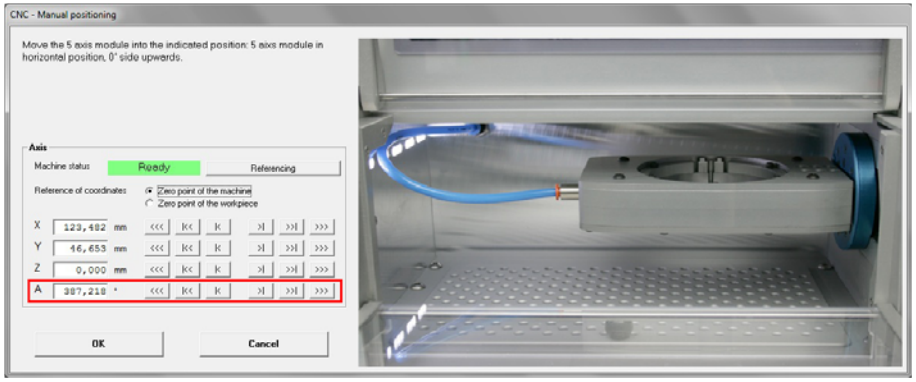

CNC - Measuring the 5 axis module
In order to change the machine over to 5 axis operation proceed as follows:
Remove the 4 axis fixing device.
Unscrew the collet chuck with a 4 mm hexagon socket screw key.
Screw the 5 axis module into the holding fixture. Fasten the screws finger-tight.
Connect the compressed air supply to the 5 axis module.
Insert measuring pin into tool changer position 5.
Next
Cancel

- Move the 5 axis module with the steering wheel as illustrated into the horizontal position with the 0° side upwards. For this purpose, you only have to move the A axis (rotary axis).

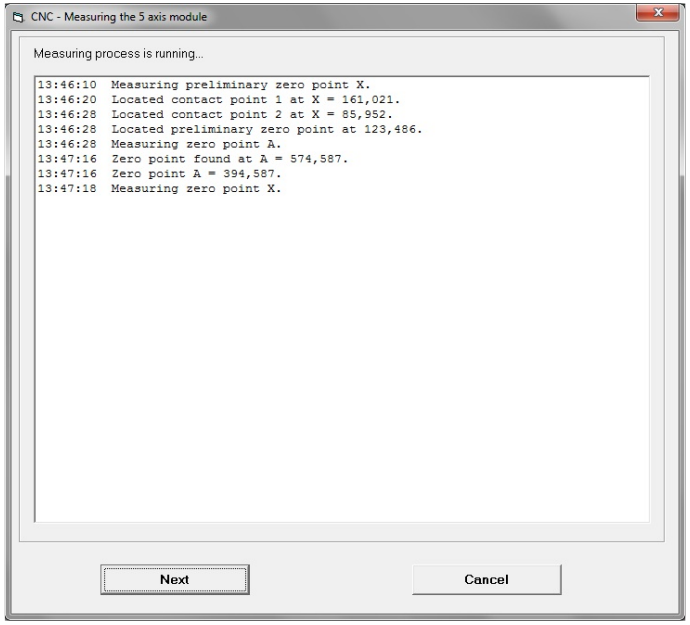
`K` 1 click equates 0.1 mm respectively 0.1 degree

`K<` 1 click equates 1.0 mm respectively 1 degree

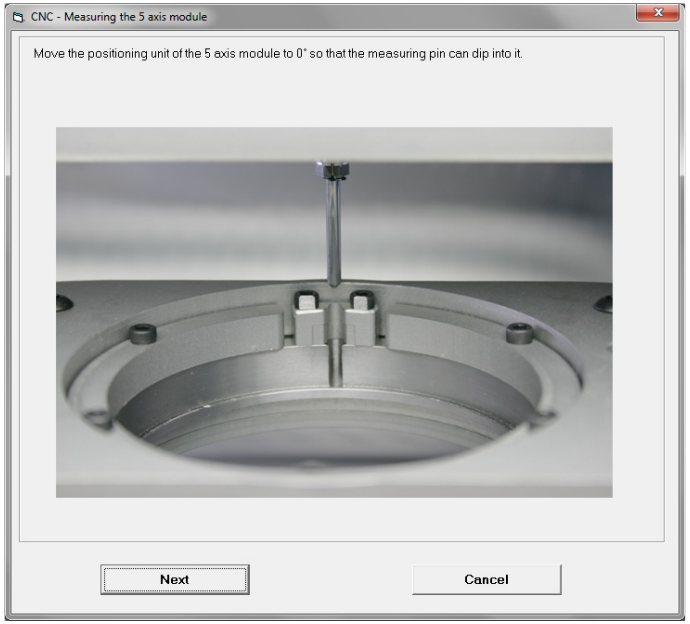
`<<<` Machine moves continuously. Accelerate by holding the right mouse button pressed. Caution! When using this feature highest attention is necessary.



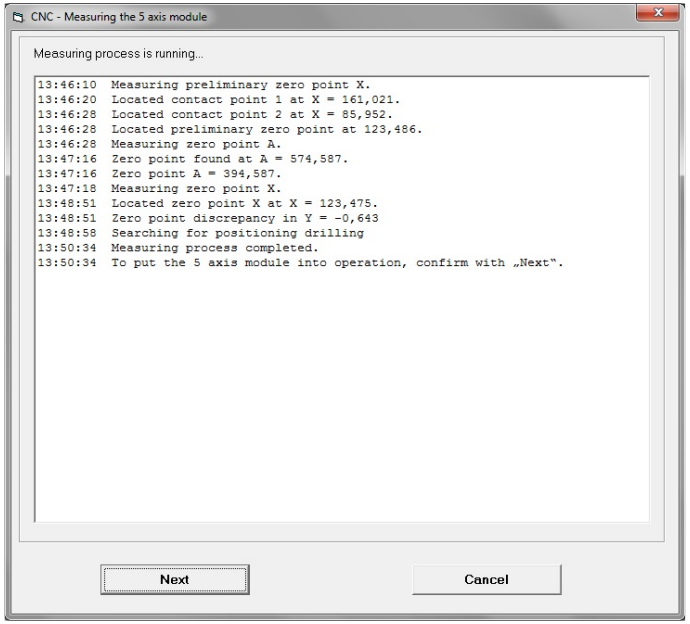
- The software then starts measuring the 5 axis module.


CNC - Measuring the 5 axis module
Measuring process is running...
13:46:10 Measuring preliminary zero point X.
13:46:20 Located contact point 1 at X = 161,021.
13:46:28 Located contact point 2 at X = 85,952.
13:46:28 Located preliminary zero point at 123,486.
13:46:28 Measuring zero point A.
13:47:16 Zero point found at A = 574,587.
13:47:16 Zero point A = 394,587.
13:47:18 Measuring zero point X.
Next
Cancel

- If necessary, move the positioning unit manually into the illustrated position and confirm this with “Next”.

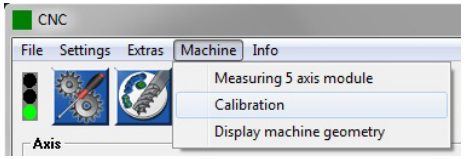

CNC - Measuring the 5 axis module
Move the positioning unit of the 5 axis module to 0° so that the measuring pin can dip into it.
Next
Cancel

- The measuring process is now completed. The protocol of the measuring process is displayed.
  By clicking on “Next” the dialogue window will be closed and you can start operating the 5 axis module.

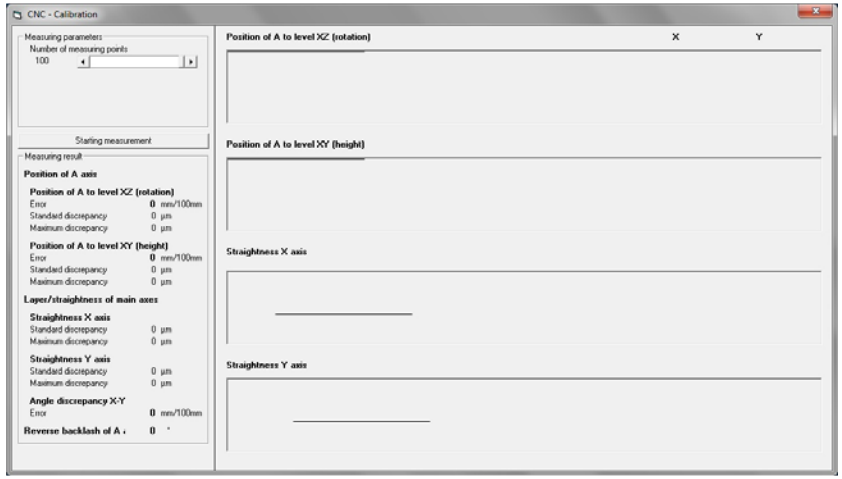

CNC - Measuring the 5 axis module
Measuring process is running...
13:46:10 Measuring preliminary zero point X.
13:46:20 Located contact point 1 at X = 161,021.
13:46:28 Located contact point 2 at X = 85,952.
13:46:28 Located preliminary zero point at 123,486.
13:46:28 Measuring zero point A.
13:47:16 Zero point found at A = 574,587.
13:47:16 Zero point A = 394,587.
13:47:18 Measuring zero point X.
13:48:51 Located zero point X at X = 123,475.
13:48:51 Zero point discrepancy in Y = -0,643
13:48:58 Searching for positioning drilling
13:50:34 Measuring process completed.
13:50:34 To put the 5 axis module into operation, confirm with „Next“.
Next
Cancel

5.4 Axis Calibration

Choose the calibration from the ”Machine“ menu or by clicking on the according icon. The software guides you through the measuring process.



Having chosen the axis measurement, you see the following interface:



As next step start the axis measurement by clicking on ”Starting measurement“.

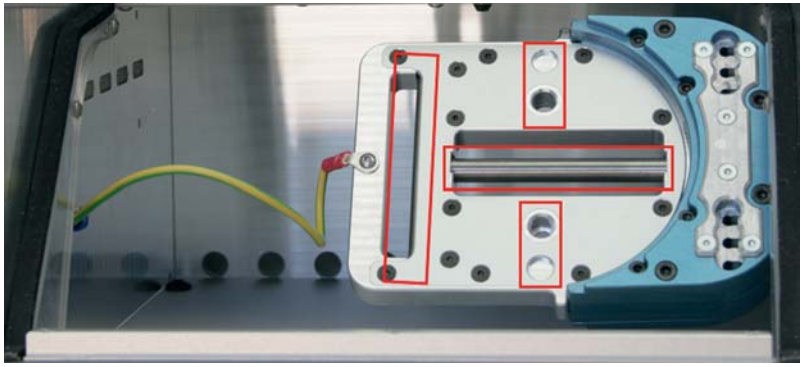
Thereupon a window pops up in which you are asked to insert the measuring pin into the indicated position of the automatic tool changing unit or to chuck it manually in the spindle (depending on machine type) and to fix the calibration plate in the fixing device.

Axes measurement
Take care that the complete working area is clean and dust-free.
Insert measuring pin in changer position 6.
Insert the calibration plate. Connect the groundcable to the housing.
Cancel
OK

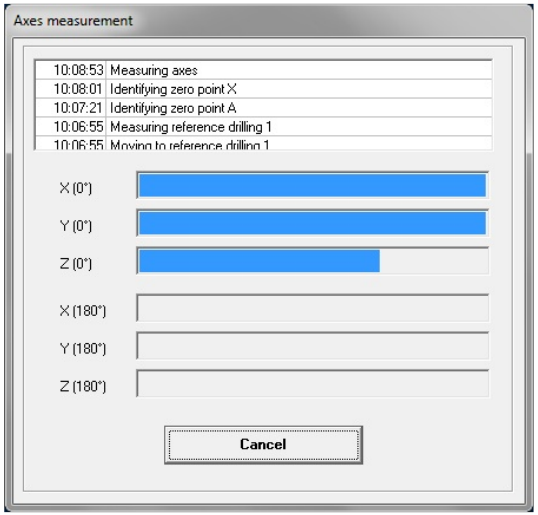
The calibration plate has to be very clean. Especially mind the embedded rods and drillings when cleaning (see subsequent illustration).

Hint! You achieve very good cleaning results with a steam cleaner. Afterwards dry the calibration plate thoroughly. Compressed air suits very good for blow-drying. The cleaning of the calibration plate must take place outside the working area.

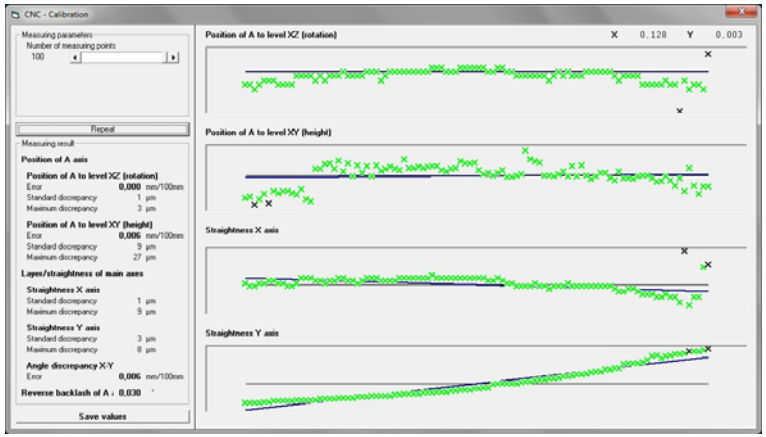
Please observe that the ground cable of the calibration plate is fixed to the working area with the screw. This is necessary to establish the mass contact which is required for the measurement. Afterwards confirm this by clicking on "OK".



You now see a window which indicates the progress of the axis measurement:



At the end of the measurement you get a graphic overview of the measuring process and of the spacial position of the axes.

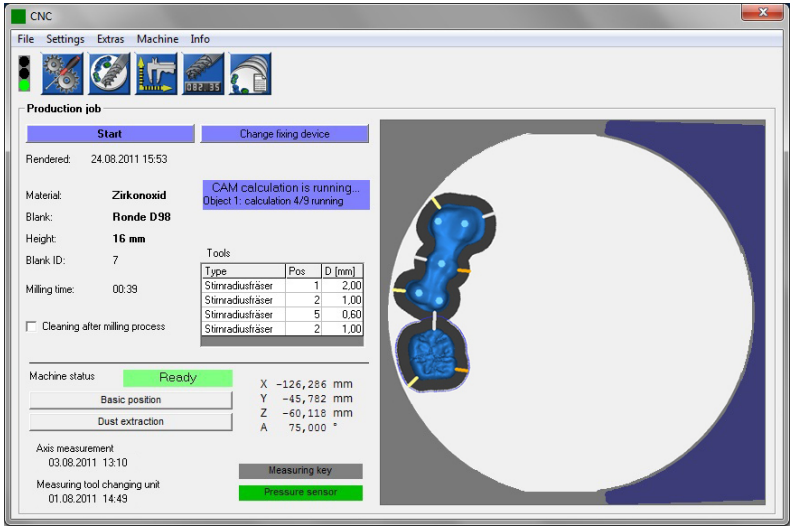


The software recognizes in each measurement 2 % of the worst measuring points and marks them black in the graphic. Measuring points marked black are not included into the calculation of the discrepancy. Measuring points marked green are taken into account for the calculation of the average value and of the discrepancy. The blue lines show the calculated average value and the position of the corresponding axes.

The graphic illustration mainly serves for evaluating the measuring results. You can see from the graphic, if the measuring plate is too dirty or damaged.

Important!
Do not forget to save the measuring protocol by clicking on "Save values"!

By means of this measuring protocol the software independently compensates any discrepancy of the a axis for the following milling processes.



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